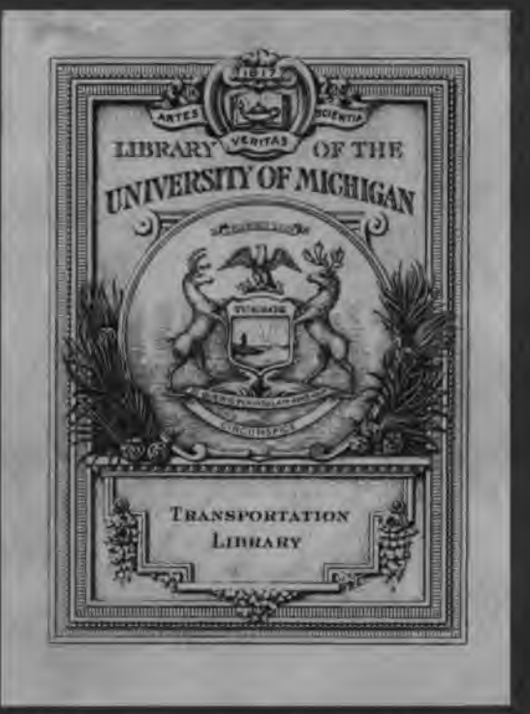
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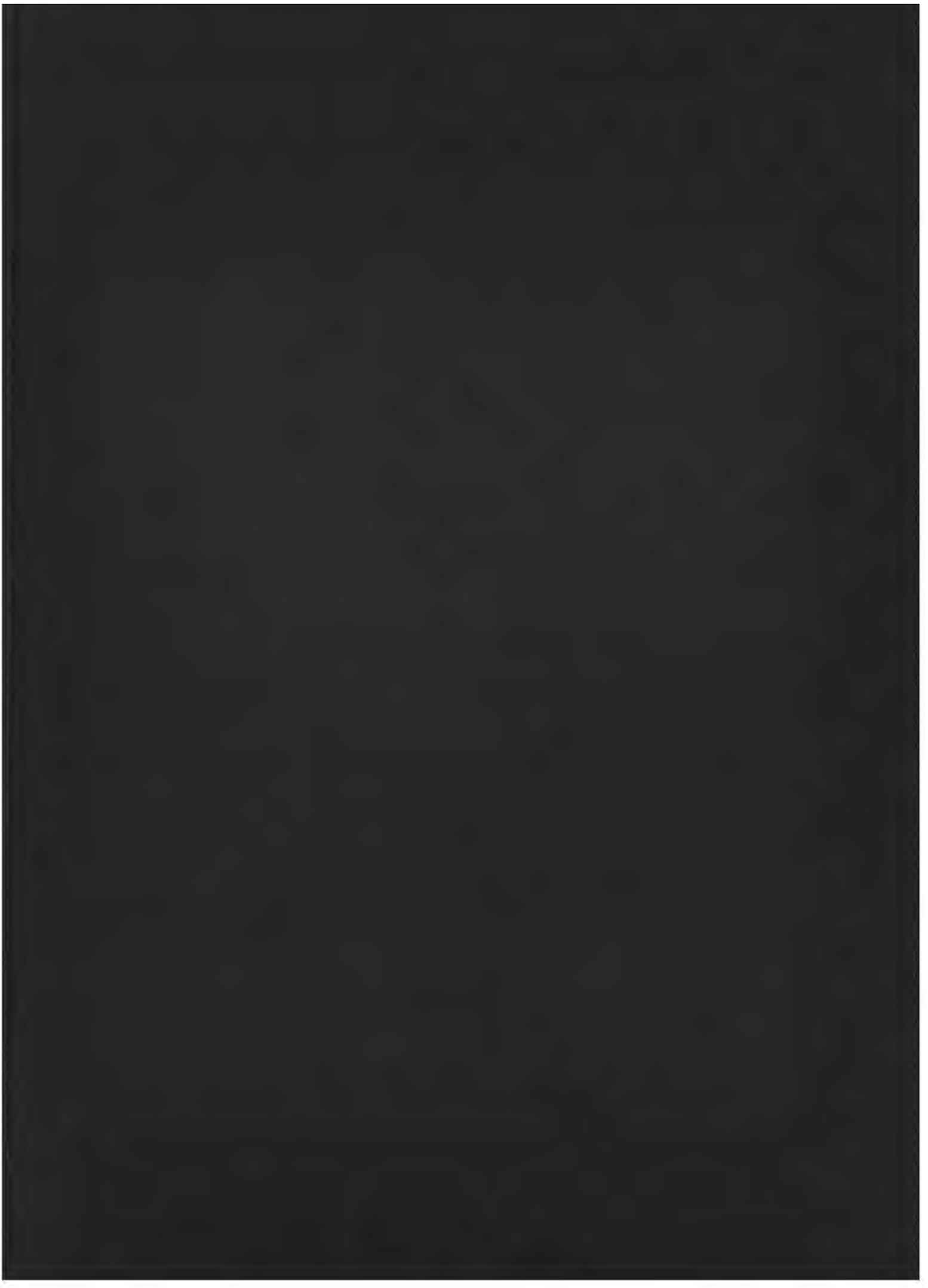

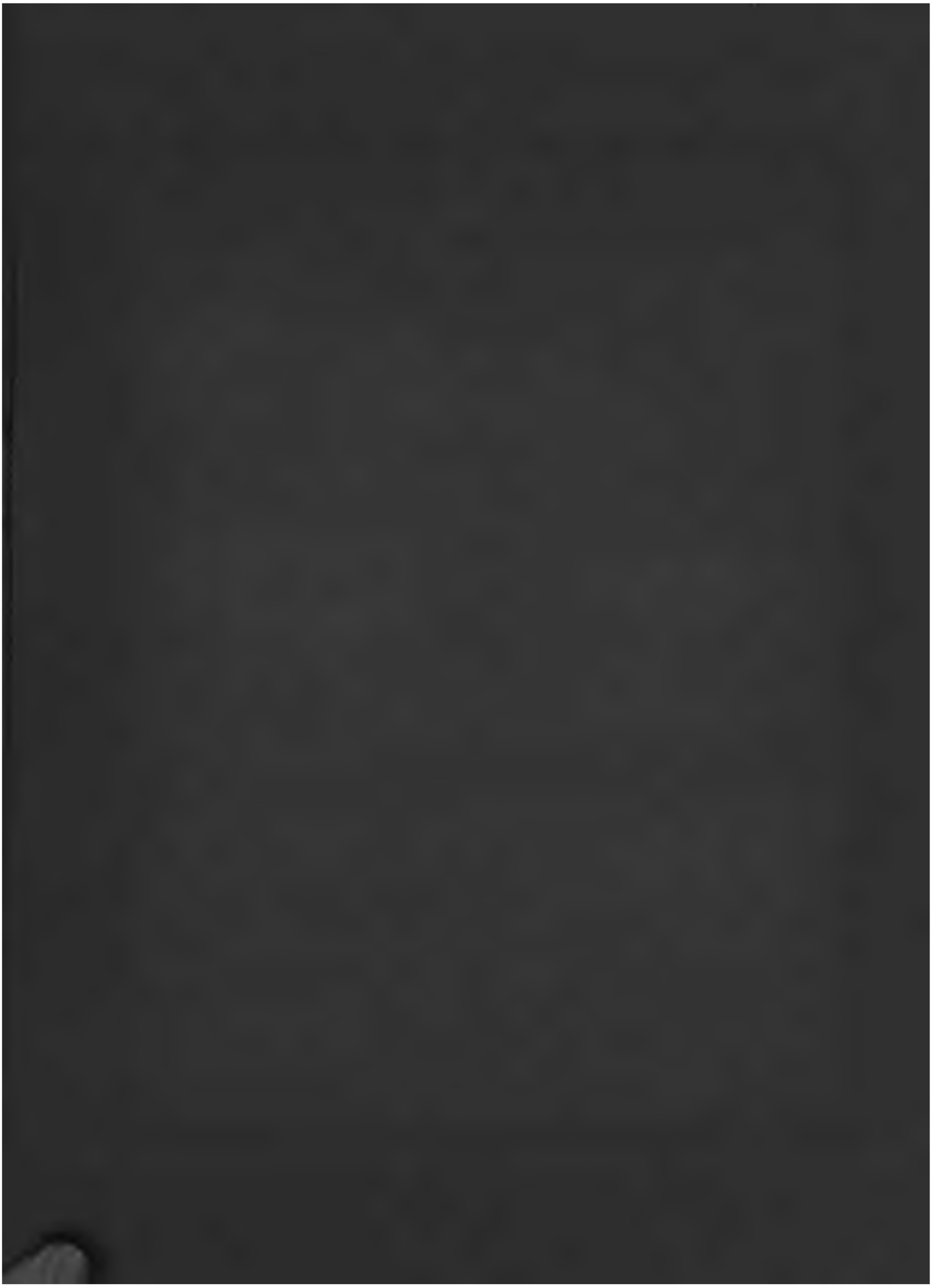

INTERIOR OF COLISEUM, 1912 EXHIBITION

YEAR BOOK
NINETEEN THIRTEEN

National Railway Appliances Association

ANNUAL EXHIBITION HELD AT
CHICAGO, MARCH 15-21, 1913

BADGE, 1911-1912

ISSUED UNDER DIRECT SUPERVISION OF THE
NATIONAL RAILWAY APPLIANCES ASSOCIATION
PUBLICATION COMMITTEE

CONTENTS

List of Members of the Association Represented in the National Railway Appliances Association Year Book for 1913

■

Foreword

WITHIN the short space of one hundred years there has been witnessed the inception and development of the second greatest industry of the world—railroad transportation. It stands in size next to agriculture, an industry which had its beginnings back no one knows how many thousands of years before the dawn of history and civilization. As compared with agriculture and the endless ages through which it has existed and developed, the growth of modern transportation has occupied comparatively a moment of time. This rapid growth of an intricate gigantic industry, almost within the lifetime of one man, has meant the meeting and solving of more problems than have ever been given to mankind since primitive man turned his back upon his animal ancestors and set his face toward the wonderful civilization which we enjoy today.

The National Railway Appliances Association, as an organization, represents the grouping together of a certain class of manufacturers who are furnishing modern transportation systems with those things which make for progress. It occupies a position in and owes a duty to the great industry of modern transportation.

Progress is the law of life. Our part as an Association in that progress which means life to the railroads, means not only honesty in manufacturing, but in acquainting those who are in charge of the operation of our railroad systems with what we are manufacturing. The purpose of the Year Book of the National Railway Appliances Association is apparent. What our Association is doing as a body, and as individual members, is of inestimable value to the men who are operating the railroads and whom we are trying to serve. Many railroad officials visit our exposition, held each year in the Coliseum and Armory at Chicago. To them this Year Book goes in order that they may have for ready reference information in regard to what has been shown at these annual exhibitions. To the railway officials who, because of pressing duties of railway service, have been unable to take advantage of what we have offered, this book goes as concise and complete information of what we are doing as an Association and as individual members in the furthering of better and more efficient railway operation.

B. V. C.

OFFICERS AND DIRECTORS

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BRUCE V. CRANDALL, *Secretary*
Ellsworth Building, Chicago

Officers and Directors 1894 to 1912

1894

President.....W. W. Salmon
Vice President.....F. A. Johann
Secretary and Treasurer.....W. H. Stearns

Executive Committee

W. H. Elliott, *Chairman*, R. L. Thomas, D. B. Ruffner, Jr., R. J. Davidson, H. W. Frost, Joseph Hansen.

1895

President.....W. H. Stearns
Vice President.....William Goldie, Sr.
Secretary and Treasurer.....H. W. Frost

Executive Committee

W. W. Salmon, *Chairman*, E. G. Fisher, R. J. Davidson, R. L. Thomas, D. B. Ruffner, Jr., W. H. Elliott

1896

All officers were re-elected to serve until next meeting, 1897.

1897

President.....E. G. Fisher
Vice President.....William Goldie, Sr.
Secretary and Treasurer.....H. W. Frost

Executive Committee

F. A. Ingalls, R. L. Thomas, W. H. Burnham, J. Alexander Brown, R. J. Davidson, W. H. Elliott.

1898

President.....William Goldie, Sr.
Vice President.....F. A. Ingalls
Secretary and Treasurer.....J. Alexander Brown

Executive Committee

E. G. Fisher, L. F. Braine, R. L. Thomas, W. H. Burnham, R. J. Davidson, W. H. Elliott.

1899

President.....R. L. Thomas
Vice President.....H. T. Wallace
Secretary and Treasurer.....J. Alexander Brown

Executive Committee

W. W. Worthington, F. A. Ingalls, E. G. Fisher, W. H. Elliott, William Goldie, Sr., R. J. Davidson.

1900

No exhibit.

1901

President.....R. J. Davidson
Vice President.....William Goldie, Sr.
Secretary and Treasurer.....J. Alexander Brown

Executive Committee

H. Elliott, Jr., F. A. Ingalls, R. L. Thomas, W. E. Clark, W. W. Worthington, J. H. Martin.

1902

President.....F. A. Ingalls
Vice President.....William Goldie, Sr.
Secretary and Treasurer.....John N. Reynolds

Executive Committee

R. L. Thomas, J. H. Martin, H. Elliott, Jr., J. Alexander Brown, R. J. Davidson, W. E. Clark.

1903

President.....Joseph H. Martin
Vice President.....J. Alexander Brown
Secretary and Treasurer.....John N. Reynolds

Executive Committee

F. A. Ingalls, William Goldie, Sr., W. E. Clark, H. Elliott, Jr., R. L. Thomas, F. A. Poor.

1904

All officers were re-elected to serve until next meeting.

1905

President.....W. E. Clark
Vice President.....John McKinnon
Secretary and Treasurer.....John N. Reynolds

Executive Committee

J. H. Martin, William Goldie, Sr., Charles W. Reinoehl, W. F. Schleiter, F. A. Poor, George Stanton.

1906

No election took place in 1906.

1907

President.....John McKinnon
Vice President.....F. A. Poor
Secretary and Treasurer.....John N. Reynolds

Executive Committee

W. E. Clark, J. H. Martin, William Goldie, Sr., William Goldie, Jr., W. F. Schleiter, George Stanton, Orlando Metcalf.

1908

President.....George Stanton
Vice President.....W. F. Schleiter
Secretary and Treasurer.....John N. Reynolds

Executive Committee

John McKinnon, J. H. Martin, William Goldie, Sr., Robert E. Belknap, T. W. Snow, Theodore Huss.

1909

President.....W. F. Schleiter
Vice President.....T. W. Snow
Secretary and Treasurer.....John N. Reynolds

Executive Committee

George Stanton, Robert E. Belknap, John McKinnon, Azel Ames, A. P. Van Schaick, J. W. Duntley.

1910

President.....T. W. Snow
Vice President.....Robert E. Belknap
Secretary and Treasurer.....John N. Reynolds

Executive Committee

George Stanton, John McKinnon, A. P. Van Schaick, Azel Ames, G. C. Isbester, T. R. Wyles.

1911

President.....Robert E. Belknap
Vice President.....A. P. Van Schaick
Secretary and Treasurer.....John N. Reynolds

Board of Directors

T. R. Wyles, George C. Isbester, S. W. Hayes, N. M. Hench, C. W. Kelly, H. M. Sperry, T. W. Snow.
On July 1st, Bruce V. Crandall was appointed secretary.

1912

President.....A. P. Van Schaick
Vice President.....T. R. Wyles
Treasurer.....John N. Reynolds
Secretary.....Bruce V. Crandall

Board of Directors

Robert E. Belknap, H. M. Sperry, Philip W. Moore, N. M. Hench, C. W. Kelly, L. R. Ashhurst, Jr., Walter H. Baldwin.

National Railway Appliances Association

THE study of the beginnings of things and the gradual development of mechanical appliances is most interesting. It might seem at first glance that it would be difficult to ascertain just what still in use. The results of investigation in this line tally not only with such ancient records as are from time to time unearthed, but they also accord very closely with the theories regarding natural development.

INTERIOR OF COLISEUM, 1909

were the first steps of the human mind in the effort to subdue nature and make it yield to all of the wants of man. But, as a matter of fact, the human race today, in different parts of the world, exists in all stages of development. The earliest wheel, the most primitive agricultural implement, the crudest water craft and transportation appliances may all be found somewhere

The National Railway Appliances Association is a product of evolution just as much as anything else in this wonderful twentieth century of ours. Out of needless competition and economic waste has been born co-operation. Co-operation and the trust have really much in common. They both came into existence due to the advancing progress of commerce. Business men of today are

NATIONAL RAILWAY APPLIANCES ASSOCIATION—*Continued*

coming more and more to recognize the folly of competition, and while competition is not being eradicated, the economic waste of competition is being minimized.

The National Railway Appliances Association stands as a fine example of that product of business evolution—co-operation. It is an organization of competitors who have wisely learned the wisdom of minimizing to at least a slight degree unnecessary competition.

What is the purpose of this association? It is, as is set forth in its constitution, recently adopted, that the objects of this association are to promote the interests of its members through mutual co-operation and friendly intercourse. Having done this, it is their purpose to go still further and to "establish and maintain cordial and proper relations between the members of the association and the delegates of the American railways." Further and more specifically, the National Railway Appliances Association is incorporated to "organize conventions and to establish and care for exhibits of members." However we may read the words printed in the constitution of the National Railway Appliances Association, the general idea, the central theme of its purpose, is that of co-operation, tending always and ever toward the lessening of unreasonable competition and economic waste. Such things make for the good of every citizen of this great country and increase the wealth and prosperity and add to the happiness of individuals everywhere. No organization, no association, no individual or group of individuals can carry on successfully any operations which are not in accordance with certain very well defined natural laws which govern all the goings out and comings in of the human race. Temporary success there may be, but it is not true and permanent and lasting.

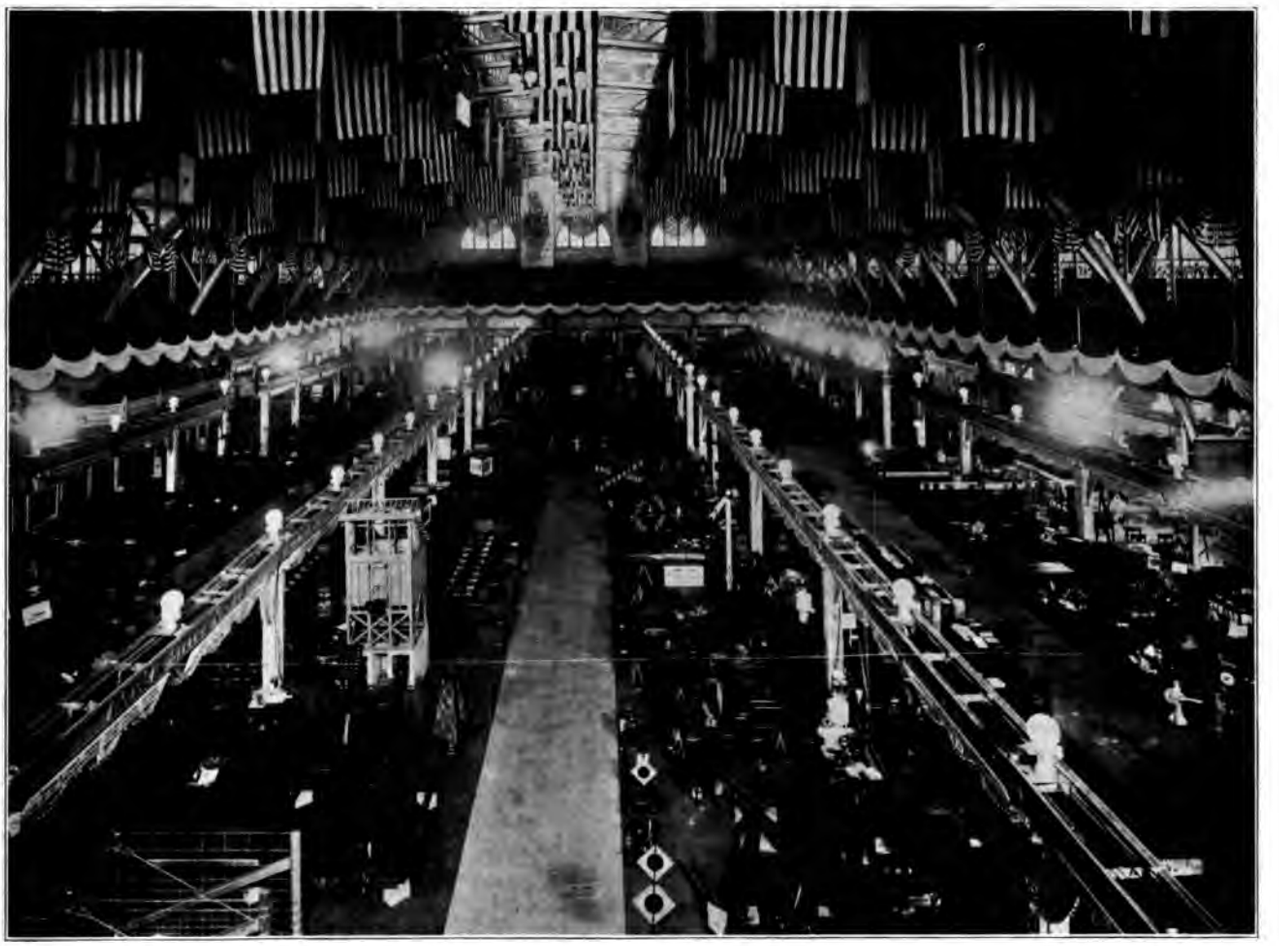
Modern transportation, almost the largest industry in the world, has its many ramifications. Among them, and not least among them, is the part played by the group of men who furnish to the transportation companies that which makes possible not only their operation and future progress but their very existence. The railroads themselves are of great and necessary importance in our national life; they are the very arteries of the body politic. Modern civilization would stagnate, decrease, even die, were it not for the great railroad transportation systems which unite man and man, community and community, by the great network that extends all over the land.

A part and an important part of the great industry of modern transportation is the also great industry of manufacturing equipment which makes possible this modern transportation.

The railroads are constantly face to face with an increasing number of problems in the operation of their transportation systems. For the solution of very many of these problems the railroad managements turn to the manufacturer of railway supplies, the very individuals or corporations who go to make up the membership of the National Railway Appliances Association. It would be impossible to attempt to estimate the time, thought, energy, money, even human life, that has been put by the manufacturers of railway equipment into the solving of problems which the railroads themselves have been called upon to meet. Who are the men today who are attempting to solve the problems of better ties, better rails, improved track facilities of all kinds? The railroad managements, it is true, are giving their time and thought to these

NATIONAL RAILWAY APPLIANCES ASSOCIATION—*Continued*

matters, but they have other matters needing solving and to their credit let it be said that they are turning to the railway supply manufacturers for a larger part of the help along these lines. There is no finer example of co-operation in our modern commercial world than that which exists between the railway officials on the one hand and the railway supply men on the other. The superiority of the American railways is no doubt due to this one fact as much as to any other.



INTERIOR OF COLISEUM, 1910

The automatic railway signal of today is where it is due to the needs of modern transportation being supplied by the railway supply manufacturer. He is the one who has dug deep into this problem; to him we look for its final solution. One has only to go back to a few years ago to remember the famous Burlington tests, remember who gave to the railroads the air-brake, without which today even fast freight trains, to say nothing of the passenger trains, would be impossible. Like a victorious army, the manufacturers of railway supplies of this country march on to conquer and subdue all before it. Here and there are leaders who stand out more prominently than the

NATIONAL RAILWAY APPLIANCES ASSOCIATION—*Continued*

rank and file, but nevertheless the rank and file is doing the work and doing important work. The greatest general in the world can accomplish nothing with an undisciplined army of ignoramuses and cowards. Credit is due, then, not only to the manufacturers of railway supplies whose names are known world wide, but also to the individuals who are unknown outside of their own little spheres. The automatic railway signal is valueless to a large extent if the signal lamp, which is to do duty at night, fails. The signal lamp is a small thing, prosaic, only a link in the chain, but nevertheless it must do its work and do it properly. That it does do the work for which it is intended is to the credit of the railway supply manufacturer. The co-operating with the railway officers has in this, as in a thousand other things, developed modern railway transportation in all its branches, until today it stands as the eighth wonder of the world. We, who are a part of all this, are too close to it to get the right perspective, to gain an adequate idea of the wonderful opportunities and the important part that we are playing in the advancement of civilization. Water and coaling stations, draft gear and brake beams, tie plates and car curtains, signal lamps and rail anchors play their part in advancing civilization, and the school and the church and the college are not the only factors that make for progress in the life of any nation. We had schools and churches and colleges thousands of years before we ever had railroads and we never had the modern twentieth century until the railroads made it possible for groups of people in various parts of the world to get acquainted with various other groups. It is the railroads that have given the human race the opportunity for co-operation.

It is in this spirit of co-operation that the members of the National Railway Appliances Association each year hold their exhibition of railway supplies in the Coliseum and First Regiment Armory. In an area of floor space of over 60,000 square feet are shown railway appliances of all kinds. Here is displayed each year equipment far too unwieldy for the manufacturer to take to the office of the railroad official and without this exhibition, this common meeting ground, the officials who have to do with the purchasing of railway equipment would have to go to the plant of the manufacturer in order to investigate and know thoroughly just what he should have for the particular needs of his own road. Co-operation again. The railroads and the men who operate them are appreciative of the value of this exhibition as is evidenced by the constantly increasing attendance at what has grown to be a veritable railway exposition.

In selecting Chicago as an annual meeting place, the national association has given an opportunity for the largest possible attendance of railroad officials at the smallest expense of time. On recognition of this fact, not only officials, but officials accompanied by many of their subordinates, visit the exhibition, not in the spirit of sightseeing, but because of the educational advantages to be derived therefrom. Year by year the progress in the bettering of railway appliances is indicated by that which is shown in the individual exhibits. From what is learned each year the railway officer and employe go back to the operation of their respective railroads better informed, better equipped for the facing of the many and intricate problems which they are called upon to solve. The railroad officials, beyond the average class of men, seem particularly adapted to making use of

A TYPICAL EXHIBIT

A TYPICAL EXHIBIT

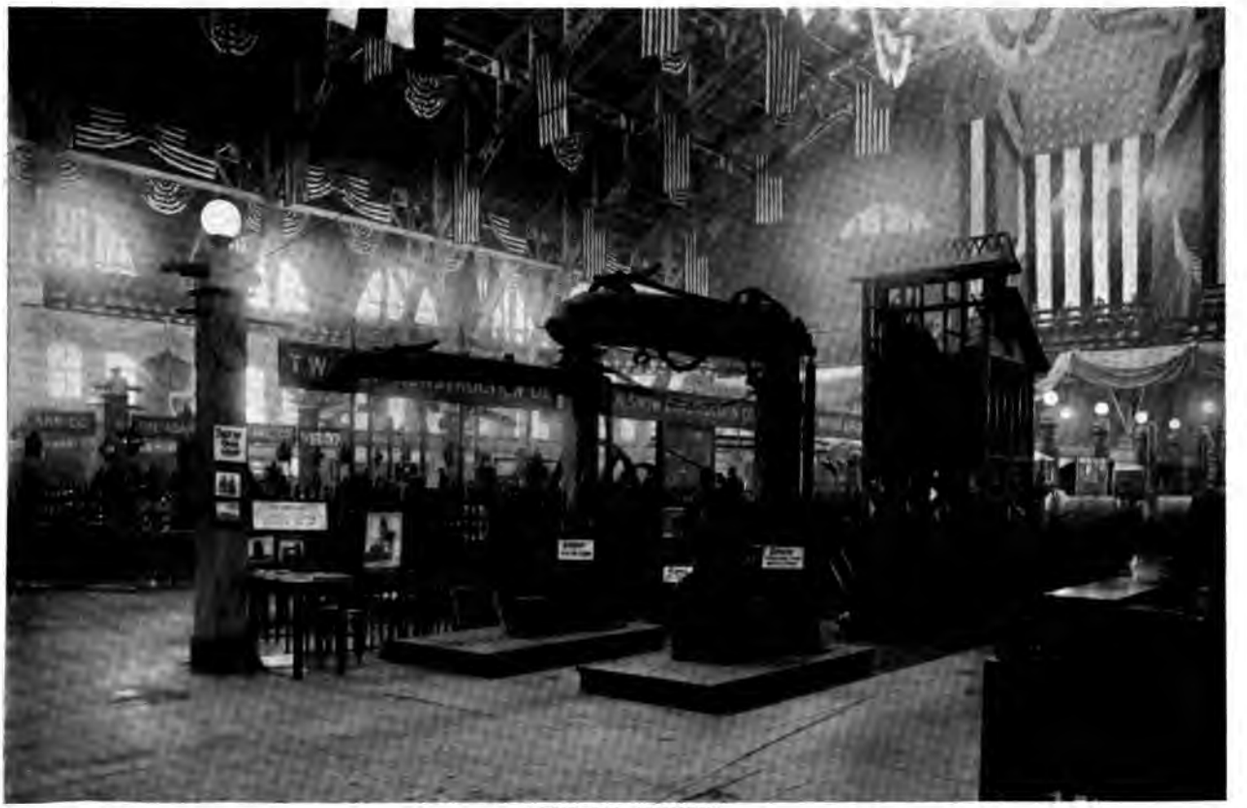
NATIONAL RAILWAY APPLIANCES ASSOCIATION—*Continued*

the ideas, the knowledge and the experience of others. They take the latest inventions, the best thought and practice of the railway supply manufacturer, purchase their product and continue to make the American railways with each succeeding year a little bit better than the years which have preceded it. The railway supply manufacturer is not governed by altruistic motives to any greater extent than other business men, but he realizes full well the value of adding to the product which he sells the experience which he has gained in the design and manufacture of that product. He knows that in serving the railroads to the utmost of his ability he is also advancing his own interests. Nowhere is a better appreciation shown of the value of co-operation than among railway supply manufacturers and in the conduct of their national association affairs.

INTERIOR OF COLISEUM, 1911

The National Railway Appliances Association has come into existence because of a real need for such an organization. It is the outgrowth of many years of progress. To the railroad men to whom this book goes, the history and details of its organization are probably of less interest than its policy and accomplishments of today. It is an

A TYPICAL EXHIBIT



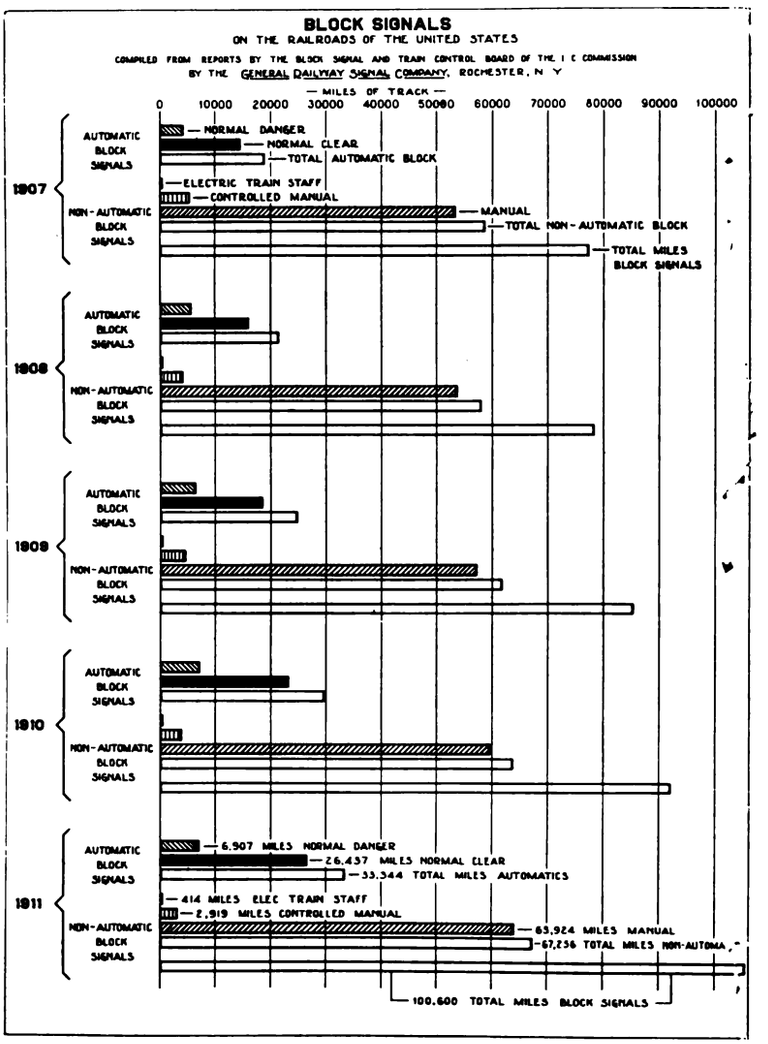
A TYPICAL EXHIBIT

NATIONAL RAILWAY APPLIANCES ASSOCIATION—*Continued*

Outgrowth of the Road and Track Supply Association organized in 1894 for the purpose of exhibiting at the annual conventions of the Roadmasters' Association of America (now the Roadmasters and Maintenance of Way Association).

Since the first annual meeting of the American Railway Engineering and Maintenance of Way Association in 1900 (now the American Railway Engineering Association), although the exhibits in connection with the Roadmasters' convention were continued until 1907, the association has given most of its time and attention to the latter organization and its exhibitions have come to be unanimously recognized as one of the most important features connected with the convention.

The membership of the association consists of corporations, firms and individuals engaged in the manufacture or sale of railway material, engineers or contractors engaged in railway constuction, publishers of the technical press and others interested in railways. The new constitution provides for the affairs of the association to be managed by a board of nine directors. The continued growth of the association and its membership and the size of the exhibition which has been given each year indicate very clearly the value of its work, and the increasingly large number of railroad men visiting the exhibition shows the appreciation on the part of the railroad managements of its practical value to modern transportation. Each year has seen a constant improvement, not only in the number and arrangement, but in the quality and variety of the exhibits. Last year, in 1912, in addition to the Coliseum and Annex, which had been used for three years, the First Regiment Armory was also engaged. In the Annex were shown mainly devices requiring a comparatively large space for their proper display, such as steel ties, special work, hoists and derricks, and track scales, while the Armory was principally occupied by the heavier track work exhibits, steel ties, switches, frogs and crossings and manganese special work. The two buildings together



NATIONAL RAILWAY APPLIANCES ASSOCIATION—*Continued*

afforded nearly 54,000 square feet of net exhibit space, which was divided into 297 spaces. The total number of exhibitors, occupying from 1 to 12 spaces, was 189, while there were many applications for space which had to be refused on account of lack of room.

The standing and strength of the association is clearly shown by the many representative railway supply manufacturers, as shown in the membership list which follows. The National Railway Appliances Association has reached its present size and importance due to the need for such an organization. Its growth has been gradual and substantial, insuring permanency. No small part of its success has been because of the wise management of some of its members who have given their time and energy to its building. To them great credit is due, but beyond all other things contributing to the success of this national association has been the spirit of co-operation which has been so strong among each and every individual member co-operating with each other that they may co-operate still better with the railway managements. The future value, permanency and success of the National Railway Appliances Association is assured.

Adams & Westlake Co., The.
Ajax Forge Co.
American Guard Rail Fastener Co.
American Hoist & Derrick Co.
American Lock Nut Co.
American Rolling Mill Co.
American Steel & Wire Co.
American Valve & Meter Co., The.
American Vulcanized Fibre Co.
Asphalt Ready Roofing Co.
Associated Manufacturers' Co.
Atlas Preservative Co. of America.
Barbey, F. A
Barrett Manufacturing Co.
Beaver Dam Malleable Iron Co.
Blessing, Louis.
Blocki-Brennan Refining Co.
Bowser, S. F., & Co.
Brach, L. S., Supply Co.
Bryant Zinc Co.
Bucyrus Co.
Buda Co., The.
Buyers' Index Co.
Carey Co., The Philip.
Carnegie Steel Co.
Carpenter, Geo. B., & Co.
Chicago Bridge & Iron Works.
Chicago Pneumatic Tool Co.
Chicago Railway Equipment Co.
Chicago Steel Railway Tie Co.
Cleveland Frog & Crossing Co.
Clyde Iron Works.
Columbia Nut & Bolt Co.
Commercial Acetylene Ry. Lgt. & Sig. Co.
Concrete Steel Co.
Conley Frog & Switch Co.
Cook Railway Signal Co.
Cook's Standard Tool Co.
Crerar, Adams & Co.
Curtain Supply Co.
D. & A. Post Mold Co.
Des Moines Bridge & Iron Co.
Detroit Graphite Co.
Dickinson, Paul, Inc.
Dieter Nut Co.
Dietzgen, Eugene, Co.
Dilworth, Porter & Co.
Dixon, Joseph, Crucible Co.
Dressel Ry. Lamp Works.
Drouvé, G., Co., The.
Duplex Metals Co.
E. D. E. Co.
Eastern Granite Roofing Co.
Edison, Thomas A., Inc.
Edison Storage Battery Co.
Electric Storage Battery Co.
Fairbanks, Morse & Co.
Fairmont Machine Co.
Federal Signal Co.
Foster, Frank M.
Franklin Manufacturing Co.
General Electric Co.
General Railway Signal Co.
Gordon Primary Battery Co.
Hall Switch & Signal Co.
Handlan-Buck Manufacturing Co.
Hart Steel Co.
Hayes Track Appliance Co.
Hobart-Allfree Co., The.
Hubbard & Co.
Indianapolis Switch & Frog Co.
Inland Steel Co.
International Harvester Co. of Amer.
International Steel Tie Co.
Iowa Gate Co.
Johns-Manville Co., H. W.
Jordan, O. F., Co., The.
Joyce-Cridland Co.
Kalamazoo Railway Supply Co.
Kelly-Derby Co.
Kennicott Co., The.
Kerite Insulated Wire & Cable Co.
Keuffel & Esser Co.
Keystone Driller Co.
Lackawanna Steel Co.
Lehon Co., The.
Lidgerwood Mfg. Co.
Lorain Steel Co.
Lufkin Rule Co.
Luitwieler Pumping Engine Co.
Lupton's, David, Sons Co.
MacRae's, The Railway & Supplymen's Mutual Catalog.
Maryland Steel Co.
Massey, C. F., Co.
McFarlane Manufacturing Co.
McGraw Publishing Co.
Morden Frog & Crossing Works.
Mudge, Burton W., & Co.
M. W. Supply Co.
National Carbon Co.
National Electric Specialty Co.
National Indicator Co.
National Lock Washer Co.
National Malleable Castings Co.
Nichols, Geo. P., & Brother.
Northey-Simmen Signal Co.
NorthWestern Construction Co.
Ogle Construction Co.
Ohio Post Mold Co.
Okonite Co., The.
O'Malley-Beare Valve Co.
Otis, Spencer, Co.
Otto Gas Engine Works.
P. & M. Co., The.
Patterson, W. W., Co.
Pease, C. F., Co., The.
Pennsylvania Steel Co., The.
Pocket List of R. R. Officials.
Positive Rail Anchor Co.
Potter-Winslow Co.
Protective Signal Mfg. Co.
Q & C Co., The.
Rail Joint Co.
Railroad Supply Co.
Railway List Co.
Railway Review.
Ramapo Iron Works.
Reliance Manufacturing Co.
Remington Oil Engine Co.
Richards-Wilcox Mfg. Co.
Roberts & Schaefer Co.
Sanitary Bunk Co.
Sellers Manufacturing Co.
Signal Accessories Co.
Simmons-Boardman Publishing Co.
Snow, T. W., Construction Co.
Southern Railway Supply Co.
Standard Asphalt & Rubber Co.
Standard Underground Cable Co.
Stark Rolling Mill Co.
Steel Railway Tie & Appliance Co.
Templeton, Kenly & Co., Ltd.
Titanium Alloy Manufacturing Co.
Toledo Pipe Threading Machine Co.
Union Draft Gear Co.
Union Iron Works.
Union Switch & Signal Co.
U. S. Wind Engine & Pump Co.
Universal Metallic Tie Co.
Verona Tool Works.
Western Electric Co.
Wharton, Wm., Jr. & Co., Inc.
Winans Impr'v'd Pat. Rail Joint Co.
Wolfe Brush Co.
Wyoming Shovel Works

Paul Dickinson, *Incorporated*

SMOKE JACKS

TO be able to furnish any size, length or quantity of Smoke Jacks is our specialty. For instance, we manufacture cast iron Smoke Jacks ranging from 24 to 48 inches in diameter, hoods 6 to 12 feet long, length of Smoke Jack, of course, to conform to height of engine house. There are several ways to solve the weight question for a building having a light roof. Twenty-six years of successful usage is the strongest argument for cast iron as the best material for Smoke Jacks. Wood Smoke Jacks of

improved design, made of fire-proofed or unfire-proofed lumber, are also one of our Smoke Jack products. We are not bound by conditions but construct Smoke Jacks to suit requirements. It will be a very easy matter for us to solve your Smoke Jack problems. Send us complete information and we shall send you blue prints and designs.

The DICKINSON AEOLUS VENTILATORS were especially designed with one idea—efficiency. Being made in any sheet metal, also cast iron, they can be used on any building. Several railroads are using these ventilators made in cast iron

for engine houses and other buildings where durability as well as efficiency are essential points. Any building requiring positive and efficient ventilation should be provided with these ventilators.

Hundreds of DICKINSON CAST IRON CHIMNEYS were in use five years ago; today there are thousands in use. This wonderful increase in the number used is due to three things; low cost and ease in application, sure fire protection and no maintenance expense. Sizes, 5 to 8 inches; adjustable to fit any pitch of roof.

The General Offices and Factory are located in Chicago. Address all inquiries to the Company, Security Building, Chicago.

Galena-Signal Oil Company

WITHOUT efficient signals the speed of modern passenger traffic would be absolutely impossible. Without efficient signals at night, more than half of the passenger traffic would be seriously delayed, and the importance of this night signalling can only be realized by thinking of the millions of signal lamps that every night guard our railroads throughout the United States and throughout the civilized world.

Anything that relates to the efficiency of these signals is of great importance. The elements that enter into the satisfactory operation of a signal lamp are the quality of oil, the design of the lamp, and the thoroughness of the care. Lack of any of these renders a lamp inefficient.

Leaving the question of quality and suitability of oil until after we have taken up the necessity for it, signal lamps must be designed to stay lighted under all unfavorable service conditions. They must give a clear, brilliant light and must make the maximum use of the oil that they burn.

Then comes the question of care. No matter how well designed a lamp may be, or how fine an oil is used in it, unless the lamps receive proper care best results cannot be expected. Proper care, to really give best results, must begin with the storage of the oil. Oil must be kept clean, free from water, and in many cases so that no evaporation is possible. The oil must be transferred to the lantern still clean. Care must be taken in filling the lantern not to fill it too full. To care for lamps to greatest advantage, rooms should be provided where the care of lamps and lanterns is placed under the direction of employes of experience and knowledge of the elements entering into the satisfactory care of oil and equipment.

With these conditions satisfactory, it is highly necessary that the oils be of proper fire test, because the heat from the burner often causes the oil in the fount or reservoir to reach a temperature above the flash test of ordinary oil used for the purpose. It is also very necessary to have a high gravity oil, especially for the long-time burners in switch and semaphore lamps that are required to remain on the stand and towers and burn for several days at a time, for unless it has this high gravity it will not have the life and spirit in it to climb the wick and get to the flame in time and in sufficient quantity to prevent the carbonization or charring of the wicks. It must be water white in color to denote its purity. Then in a cold country it must have a low cold test to withstand the low temperature to which all these lamps are exposed during the winter months in the greater part of our country. The oil must be of uniform quality, and of the peculiar properties developed by experts familiar with the service in which it is to be used.

The Galena-Signal Oil Company has long been recognized as an authority on the proper kind of oil to use for a given purpose. We can develop oil of the required properties for any use that is necessary.

Our experts are continually at the service of our patrons to give instructions in the use of our oils for illumination and lubrication.

In conclusion, then, satisfactory signalling depends on the design of the lamps, the care of the lamps by the railroads, the care of the oil and the proper adaptation of the oil to its peculiar service, which can only be done by a firm maintaining the staff of experts for that purpose that is at the service of patrons of the Galena-Signal Oil Company of Franklin, Pa.

The Hobart-Allfree Company Derailers

DERAILERS which are installed with consideration of only ordinary conditions, or perhaps only for moral effect, may apparently give satisfactory service, but sooner or later the unexpected is going to happen with the inevitable costly results. Every Derailer should be thoroughly efficient in actual derailments under all conditions with enough surplus strength to assure positive action at critical moments, for if they can not be depended upon at such times, they defeat their own purpose. The Derailer is an emergency appliance.

There was a time when the old "scotch block" or similar devices were thought to be good enough, but with the first models of Smyth Derailers as *pioneers*, this condition gave way to progress and derailer protection is now practically universal. Then it was thought that most any derailer was good enough; but that time too is passing, and the differences in the designs of derailers are being given more careful consideration with keener appreciation of the points which make for reliability.

Freeland and Smyth Derailers are better than they need to be for ordinary derailments and moral effect. They are made for the unusual stresses and they "make good" every time.

They are the derailers with a *lip*. This strong feature, which secures them against side thrust, opens the way to other effective modifications which would otherwise be impracticable. The most important of these is sufficient length to insure derailment at high speeds. These and other strong features are described in a complete catalog which may be had by writing to the manufacturer.

The office of The Hobart-Allfree Company is in the Old Colony Building, Chicago, and inquiries addressed there will receive prompt and careful consideration.

Union Draft Gear Company

Cardwell Friction Draft Gear

THE most important appliance that has to do with the economical maintenance of the freight car is the draft gear. How great is its importance may be realized when one stops to consider that this is the one device on a car that has more to do with the relations of the individual car to other cars than anything else that is put into a freight car.

In other words, the draft gear is that device which, in service, should defend the car from the shocks which it must receive from other cars. It is a device which must prevent break-in-twos, the disastrous effects of which are too well known to need any comment.

A few years ago when nothing but wooden freight car construction was used by the railroads, the necessity for the draft gear was not so great as it is today, when so many cars of steel construction are in use. The wooden car itself was in a certain sense a draft gear, and did a large part of the work that the draft gear is now called upon to perform. A plain block of wood that will crush under impact would in a way make an excellent draft gear, and there is in the wooden car a certain amount of "give" which is not found in the steel car, or the steel underframe. When in the course of a few years all of the wooden cars have been relegated to the side track and the scrap heap, railroad managements are going to be confronted with a very serious situation unless their steel and steel underframe cars are provided with a draft gear that will destroy the greatest amount of shock. Without the right kind of a draft gear the item of car repair expense is going to continually increase.

The draft gear should be such an arrangement which best distributes the least shock to the entire car. This can only be done by a properly designed friction draft gear.

It should be the function of a draft gear to destroy the shock or blow.

A great deal of the damage that should be charged directly to the draft gear has been taken as a matter of course.

It has been thought that the function of the draft gear is that it be so constructed that it can pass on or distribute to the car the shocks received in service without injury to itself.

This idea of distributing shocks is a pernicious one, and the damage resultant is simply tremendous. To distribute a shock means the dividing of its force, which all goes through the car body, causing the car to get old, siding to get loose, side doors racked and knocked off, running boards to become loose, as well as the roofs, which soon begin to leak, cause loads to shift and take the ends out of cars.

A car can be properly constructed, equipped with good trucks, and bolsters, and brake beams, and underframes, and couplers, and can be built right from the wheels to the roof, but you can't go and stick in a couple of springs with any kind of attachments, or the best kind of attachments, and have a real draft gear; and if you don't have a real draft gear, you won't have a real freight car—not for long.

The elimination of the expense to railroads of many millions of dollars is possible by the use of the BEST friction draft gear.

Detroit Graphite Company

Bridge Paint Makers

The use of "Superior Graphite Paint" for the protection of bridges and viaducts is bridge insurance. This fact has caused its adoption as standard by many of the leading railroads in the country for the specifications of their new work and the repainting of old.

Bridges in this day suffer most severely from smoke, fumes and cinders. The sulphur in these fumes combined with moisture forms sulphuric acid, which induces corrosion and causes the destruction of exposed surfaces with great rapidity. It has been the aim of the Detroit Graphite Company for the past twenty years to manufacture a paint that would overcome these conditions, and the continued growth of the company is evidence that the "Superior Graphite Paint" which it manufactures has been a successful paint for bridge and metal coating.

Municipal Bridge in St. Louis, Painted With "Superior Graphite Paint" Nos. 30 and 32.

The actual cost per year to keep structures in first-class condition is not necessarily a question of how much per gallon paint sells for, but rather how long will it wear and how soon will it be necessary to purchase and apply more paint? "It costs no more to apply good paint than poor paint."

The selection of this paint for the Municipal Bridge in St. Louis was the result of careful investigation of previous records of the material on similar structures.

The illustration of the Omaha Terminal Bridge of the Illinois Central is very clear evidence that this paint will give from seven to nine years' service when well applied.

The use of different colors for different coats is an advantage in that it insures a thorough covering for each coat. With this in view, paint is manufactured in several colors, especially adapted for this purpose: No. 30, black; No. 32, brown; No. 35, red; and No. 38, olive green.

Uniformity of mixture means standard of quality. The graphite ore used is from our own mine near Lake Superior, and thirty years of mining has shown no variation in its analysis.

Unusual attention is given to the manufacture of special paints for special purposes, especially Railway Standards for bridges, stations, signals, coal chutes, water tanks, etc.

The Detroit Graphite Company maintains its own laboratories for testing of raw material purchased, such as linseed oil, C. P. (chemically pure) tinting colors, etc., to insure their purity and uniformity.

Offices are maintained in most of the principal cities, where standard specifications covering the painting of new work and the repainting of old, and other information desired, can be secured.

DETROIT GRAPHITE COMPANY
Paint Makers Detroit, Mich.

Canadian Factory
DOMINION PAINT WORKS, *Limited*, Walkerville, Ontario

Richards-Wilcox Manufacturing Co.

R.-W. 150½ B. Jumbo Ball-bearing Door Hanger.

THE manufacturing facilities of the Richards-Wilcox Mfg. Co., Aurora, Ill., (makers of door hangers and track for all kinds of sliding doors, parallel door hardware, underwriters' approved fire-door fixtures and overhead merchandise carrying systems) embrace the most advanced methods as well as machinery. Special attention is given to accuracy of workmanship, careful designing and the use of high grade material. The high efficiency, durability, the ease of installation, and the low cost of maintenance developed by their use, tend to make Richards-Wilcox products appeal to the discriminating engineer and roadway official who recognize and endeavor to keep up with the spirit of progress that is so much in evidence in the present period of mechanical development.

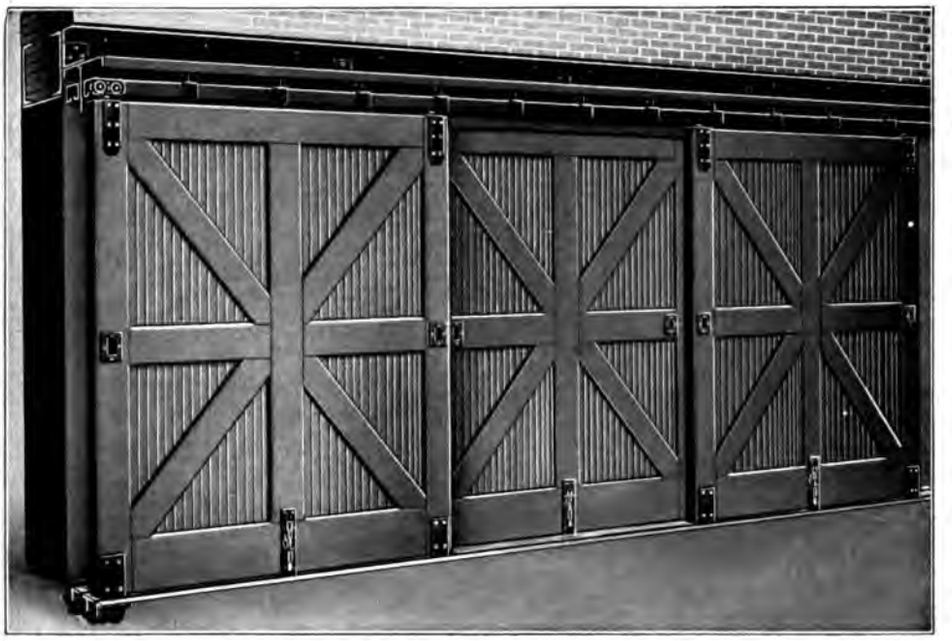
This company maintains a staff of men whose training and experience have particularly equipped them with a practical knowledge of the design, construction and installation of its various products, which places at the command of their clients an authoritative co-operative service.

Their complete catalog should be in the hands of every roadway official, engineer and purchasing agent. It will be mailed immediately on request made to their main office. Detailed blue-prints will also be furnished of any items.

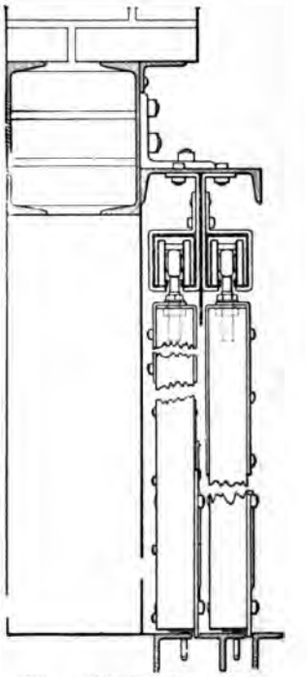
This company's works and main offices are located at Aurora, Illinois, with branch offices in New York, Boston, Philadelphia, Chicago and St. Louis.

R.-W. 102 Monarch Fire-Door Fixture.

Richards-Wilcox Manufacturing Co.

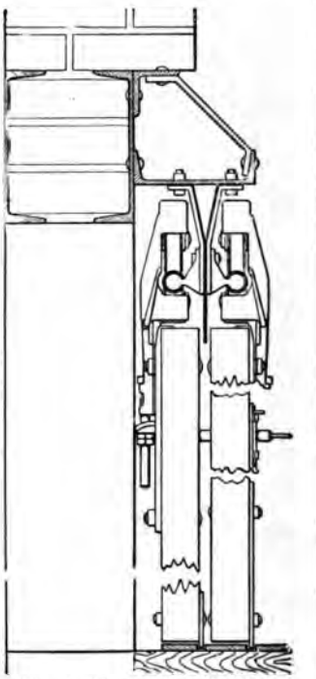


(Fig. 1) PARALLEL DOOR EQUIPMENT, "TROLLEY TRACK TYPE."
Doors have both vertical and lateral adjustment.



(Fig. 3) Vertical Cross Section,
"Trolley Track Type."

(Fig. 2) PARALLEL DOOR EQUIPMENT, "TUBULAR TRACK TYPE."
Doors have both vertical and lateral adjustment.



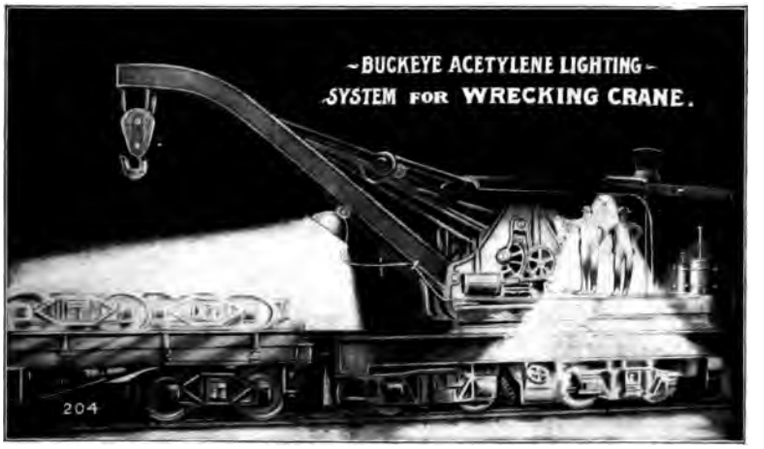
(Fig. 4) Vertical Cross Section,
"Tubular Track Type."

The Buckeye Line

Soft Metal Melting Furnaces

Made in a number of different designs

Ask for our catalog No. 23



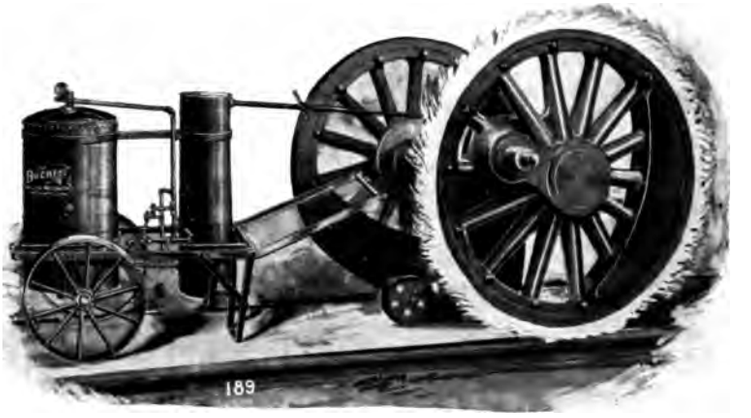
Carbide Lights for Cranes and Wrecking Outfits

The Buckeye Heater for Car Repairs

Buckeye Tire Heaters

made in a number of different designs

Ask for our catalog No. 25



Sole Makers

The Macleod Company 213 East Pearl Street **Cincinnati, Ohio**

The Buckeye Line

Oxy'acetylene Welding and Cutting Apparatus Portable and Self Contained

☞ We build a number of different designs

No Railroad Repair Shop is complete without one

Very often save their first cost within a month

Ask for our catalog No. 59

The Buckeye Heater

The most powerful portable Torch invented

In use by over 300 Railroads

Made in two designs

In extensive use for Car Repairs and many other operations

Get our catalog No. 21

The Buckeye Carbide Light

for construction work and wrecking outfits

Operating costs less than one cent for each 1,000 candle power per hour

Get our catalog No. 24

The Buckeye Sand Blast

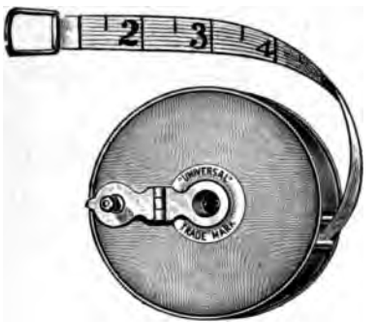
for cleaning Steel Cars, Bridges, etc.

Get our catalog No. 50

SOLE MAKERS

The Macleod Company, Cincinnati, Ohio

213 East Pearl Street



LUFKIN

Hopes to meet you at the convention

Of course, we'll be there, stationed at our old corner, SPACE No. 121

We're there to renew old acquaintances and make new ones,
and, incidentally, to show you our line

Measuring Tapes and Rules

We are proud of our goods and the friends they have made

OUR GOODS ARE RECOGNIZED
AS LEADERS OF THE FIELD

NEW YORK OFFICE AND STORE
No. 106-110 LAFAYETTE STREET

LONDON OFFICE AND WAREHOUSE, 118-122 HOLBORN, E. C.

THE LUFKIN RULE CO.

SAGINAW, MICH.
WINDSOR, ONT.

Union Station, Kansas City, Mo., (under construction) 1,000,000 square feet Sarco No. 6 Waterproofing.

Chicago & North-Western Terminal, Chicago, 600,000 square feet Sarco No. 6 Waterproofing, 225,000 square feet Sarco Flooring.

THE STANDARD ASPHALT & RUBBER COMPANY offer in their SARCO No. 6 Waterproofing a material that, when applied according to the SARCO Method, will remain effectively water tight under all kinds of service conditions.

Water will neither dissolve nor corrode SARCO No. 6 Waterproofing. It forms a permanent shield that is impenetrable by water and will not alter or change its condition.

That kind of waterproofing is a profitable investment. It eliminates heavy maintenance or replacements and when considered on the basis of the "cost per year of service" is the most economical form of waterproofing that can be had.

The base of SARCO No. 6 Waterproofing is Utah Gilsonite, which is a perfectly waterproof substance and is the purest and most costly natural asphalt the world produces.

SARCO No. 6 Waterproofing is produced by patented methods exclusively owned by the Standard Asphalt & Rubber Company, which are recognized as the most thorough of any that have ever been developed for the refining of high grade asphalts.

In addition to the perfect waterproof qualities of SARCO No. 6 Waterproofing its utility is intensified by the SARCO Methods of application. To those contemplating the installation of waterproofing, we offer the services of our Engineering Department to assist in the preparation of plans for placing waterproof protection for all types of construction.

Our long experience in waterproofing work qualifies us to offer expert counsel, which considers not only the efficiency and permanency of the installation, but also its cost.

The illustrations bordering this page show the variety and magnitude of the different construction work on which SARCO No. 6 Waterproofing has been specified and used.

We would be pleased to furnish any desired information concerning SARCO No. 6 Waterproofing or the methods of application and will gladly supply estimates of cost, etc.

Write for booklet "Permanent Waterproofing."

SARCO Mineral Rubber Floors are shown in two of the illustrations on this page. This is a solid sheet floor composed of SARCO Mastic, SARCO Flux, and fine-grained mineral matter heated and put in place while in plastic condition.

This floor presents a solid, smooth surface, free from joints. It is extremely durable, adapted to either foot or trucking traffic, is perfectly waterproof, will not pulverize and is sufficiently resilient to be positively noiseless, but rigid enough to resist displacement.

We have a booklet describing SARCO Mineral Rubber Floors, the uses to which they are adapted, the manner of construction and a general idea of their cost. If you desire a copy, please ask for booklet "Asphalt Floors."

STANDARD ASPHALT & RUBBER COMPANY

137 South LaSalle St. Chicago, Illinois

Sarco Mineral Rubber Floor, Canadian Pacific Railway Shop

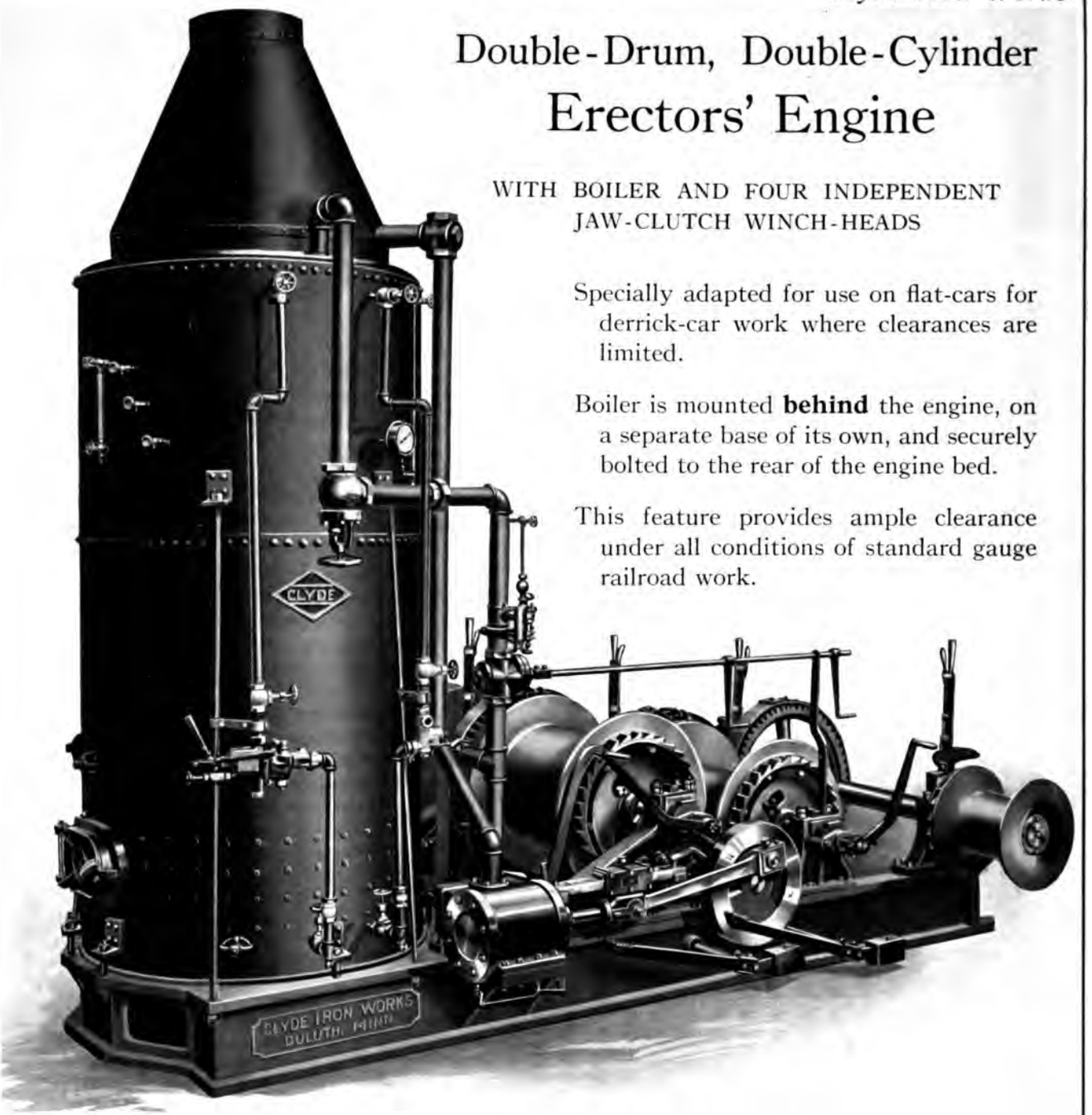
Concrete Viaduct, B. & O. C. T. R. R. waterproofed with Sarco No. 6 Waterproofing

Sarco Mineral Rubber Floor, Freight Loading Dock, Libby, McNeil & Libby, Chicago

Clyde Iron Works

Double-Drum, Double-Cylinder Erectors' Engine

WITH BOILER AND FOUR INDEPENDENT JAW-CLUTCH WINCH-HEADS



Specially adapted for use on flat-cars for derrick-car work where clearances are limited.

Boiler is mounted **behind** the engine, on a separate base of its own, and securely bolted to the rear of the engine bed.

This feature provides ample clearance under all conditions of standard gauge railroad work.

STEEL GEARS AND RATCHETS

Engine Number	Size Cylinders Inches Bore Stroke	Horse Power	Size of Bed Inches	DRUMS		Load Capacity on Single Line at Normal Speed, Lbs.	Weight Pile Driver Hammer For Rapid Work, Lbs.	BOILER			Approx. Shipping Weight Lbs.	
				Diam. Inches	Length Between Flanges			Diam. Inches	Length Inches	Number 2-inch Flues		
646	8¼x10	40	54x176	14	23	9000	4000	48	102	130	21000	.....
647	9x10	50	54x176	14	23	10000	4500	48	102	130	21800	.....
648	9x10	50	54x176	14	23	10000	4500	54	102	180	22800	.....
649	10x10	60	56x210	18	24	11000	5000	54	102	180	27000	.....
650	10x12	70	56x213	18	24	13000	5500	60	102	212	29100	.....

Duluth, Minn., U. S. A.

Clyde Erectors' Engine

SPECIALLY ADAPTED TO THE REQUIREMENTS OF THE RAILROAD ERECTOR

THE engine shown on the opposite page is an example of Clyde engine-construction for **special** purposes.

It is designed to obviate the clearance difficulty which has hitherto been experienced in railroad construction work where standard erector's engines have been mounted on flat-cars for derrick-car work.

The engine bed is narrower than in the standard erectors' engine, and **the boiler is low** enough to give ample clearance for bridges, tunnels, etc., on standard gauge railroads.

To accomplish this, and still retain boiler capacity, the boiler is mounted on a separate base of its own and securely bolted to the rear of the engine bed.

The engine has two standard friction drums for general hoisting purposes, and **four** independent winch heads operated by jaw clutches. These winch heads may be used separately or all at once, and are invaluable in spotting and in handling beams, timber, steel, etc.

The winches are smoothly finished and are large enough to carry ample rope. They are operated by latched levers on quadrants.

Each winch head and ratchet is cast in a single piece, and has a short, stout pawl with which the load may be held when the clutch is thrown out.

The winch-heads run loose on the shaft and are bronze-bushed.

The entire engine is designed for heavy and severe service, and contains none but material of proven superiority, as do all engines of CLYDE-GRADE.

The main gears of **every** CLYDE engine are made of open-hearth steel, having an ultimate tensile strength of 65,000 pounds per square inch.

The bed, drums, side-frames, eccentrics, eccentric-straps, and crank-discs are made of ferro-steel (sometimes called semi-steel) which has an ultimate tensile strength of 31,000 pounds per square inch; more than **twice** that of the castings used in engines other than those of CLYDE-GRADE.

The piston rods are made especially strong, eliminating all possibility of breakage.

The cross-heads, with their bronze-bearing gibs, are longer than on any other type of engine, reducing wear and vibration to a minimum and thereby insuring proper alignment and eliminating repair charges.

All levers are within easy reach of the operator, placing the machine absolutely under his instant control without changing his position.

All like parts are interchangeable, and duplicate parts are carried in stock at our warehouses in Duluth, Chicago, New Orleans and Portland.

Our new 235-page catalog of hoisting engines and derricks has recently come from the press. A copy is yours on request. Send for it.

MANUFACTURERS OF

CLYDE-GRADE HOISTING, EXCAVATING AND LOGGING MACHINERY

AT DULUTH, U. S. A.

CLYDE IRON WORKS
DULUTH, MINN.

BRANCH OFFICES AND WAREHOUSES:

CHICAGO: 343 So. Dearborn Street
A. E. HOLCOMB, Manager

NEW ORLEANS: 414-16 Carondelet Street
H. FLETCHER, Manager

PORTLAND: 18th and Upshur Streets
H. C. BECKWITH, Manager

AGENTS *in all* IMPORTANT CENTERS

Lidgerwood Manufacturing Company

THIS Company has been in business for more than forty years, and has the largest shops in the world devoted exclusively to hoist making. Their product includes steam and electric winches adapted practically to any purpose of lifting and haulage.

The Lidgerwood Rapid Unloader has done more, perhaps, than any other device

Lidgerwood Rapid Unloader

except the steam shovel to cheapen railroad building. The Rapid Unloader is a powerful hauling engine which draws a plow through a train, sweeping off the load as it moves. The Unloader is mounted on a flat car coupled next to the locomotive where the Unloader can take steam from the locomotive. The cars used are either ordinary flats with nothing added, except steel aprons to extend from car to car to make a continuous floor throughout the train, or similar cars with swinging top-hung side doors giving a capacity of forty to forty-five cubic yards. A train can be unloaded in five minutes. These cars cost only half as much as twenty-ton dump cars and the dead weight of a complete "Lidgerwood" train is only 1,000 pounds per cubic yard of load against 2,000 pounds for dump cars. This means smaller investment, less trackage, locomotives and men and cars available for regular railroad use when construction work is ended.

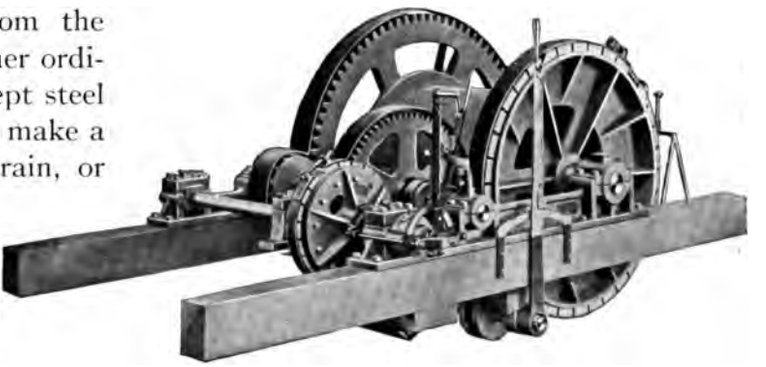
The 100,000,000 cubic yards of excavation at Culebra Cut at Panama is nearly all being handled by Lidgerwood Unloaders. Eleven of them unload 1,250,000 cubic yards of spoils monthly. The Isthmian Canal Commission has thirty Unloaders.

A hundred railroads and nearly as many railroad contractors use the Unloaders. Some railroads own more than twenty.

The Incline Coal Car Hoist is for drawing loaded cars up inclines at coaling stations. They are operated by steam, electricity, gasoline or belt. They have several valuable special features. The most important of these is an automatic brake which holds a car safely at any point on the incline, and prevents accidents even when handled by ordinary labor.

Lidgerwood products are noted for their high quality. A duplicate-parts system of manufacture insures perfect fitting parts originally and for repairs.

The home office of the company is in New York City. Branch offices are in



Lidgerwood Incline Car Hoist

Chicago, Boston, Philadelphia, Pittsburgh, Cleveland, Seattle, and San Francisco. The main works are in Brooklyn, N. Y., and the Foundry Department in Newark, N. J.

Steel Water Tanks for Locomotive Service

Standard Elliptical Bottom Locomotive Service Tank

After many years of successful experience in building the hemispherical bottom steel tank, the ***Chicago Bridge & Iron Works*** seven years ago introduced another type of tank, especially adapted for locomotive service. This tank has proved so satisfactory to the large number of users that especial attention is now called to some of its merits.

Standard Conical Bottom Locomotive Service Tank

The design combines strength, durability and pleasing appearance. All surfaces, both inside and out, are open for inspection, and are easily accessible for painting.

The tank is built of large diameter and shallow depth, thus reducing the variation in pressure to the lowest practicable limits. This tank is provided with a riveted steel riser pipe which makes it an all steel structure. The large riser serves as a settling basin for any sand or sediment in the water. It is equipped at the extreme bottom with a six inch washout valve so that the tank can be cleaned at any time without emptying. The outlet pipe extends several feet above the bottom of the large riser, so that only clear water is drawn off. The riser pipe is made of sufficient diameter to prevent interruption of service from freezing. This construction eliminates the need of any temporary wooden frost casing. The fact that the large riser is riveted directly to the flexible tank bottom obviates the need of any troublesome expansion joint.

THIS IS THE ONLY TYPE OF TANK WHICH DOES NOT REQUIRE AN EXPANSION JOINT

Standard Hemispherical Bottom Steel Tank with Wooden Frost Casing

The ***Chicago Bridge & Iron Works*** also design, manufacture and construct standpipes, coaling stations, oil tanks, gasholders, bridges, turntables, creosoting plants and structural material.

The company's offices are located at

CHICAGO NEW YORK
DALLAS, TEXAS
GREENVILLE, PENNSYLVANIA

The manufacturing plants are at

CHICAGO, ILLINOIS
GREENVILLE, PENNSYLVANIA

150 Ton all Steel Coaling Station

T. W. Snow Construction Company

Snow Water Cranes

WE illustrate herewith our new type water crane with telescopic spout. This crane is constructed to meet every requirement of the railroads. Manufactured with three styles of spouts—rigid, flexible and telescopic.

Tests made at the University of Illinois in 1911 demonstrated that this crane would deliver more water than any other on the market.

We should be glad to send you catalog showing all styles of cranes, not only for water but for fuel oil.

Our business is not confined to machinery for handling water. We also sell and construct coaling stations, water softening plants, etc.

In regard to anything supplied by us to the railroads, we will gladly furnish detail information. This can be had by addressing the T. W. Snow Construction Company, General Offices, Ellsworth Building, Chicago, or to our eastern sales agents, Quincy & Gilman Engineering Company, 90 West Street, New York City, or to our western sales agent, L. P. Tolman, Central Building, Seattle, Wash.

On the opposite page you will find cuts, and a brief description of the Bowman Ditcher and Grader. Your time will be well spent in thoroughly investigating it.

Bowman Ditcher Plowing Ditch

Loading Material into Buckets

Hauling Material Out of Cut

T. W. Snow Construction Co.

Bowman Ditcher and Grader

THE Bowman Ditcher and Grader is the most wonderful invention of the day for railroad ditching and grading. It is the only thoroughly practical machine manufactured for this class of work, and is guaranteed to perform its duties with a saving of 50% over any other method now being employed.

The Bowman Ditcher and Grader has no equal for simplicity in operation. Only three men are required to operate it, one man to handle the air valves and two laborers for miscellaneous work. Compare this with the number of men required to operate any other machine for similar work.

The machine is complete in every respect, ready for operation when delivered. The different tools and accessories are mounted on an all-steel flat car, forty-two feet long, of standard gauge, which is fitted with air brakes and other standard equipment.

There are four cranes, two on either side, which handle the plows, slopers and scoops. These tools are elevated and lowered with compressed air. The various operations may be performed on either or both sides of the car at one time if so desired, and conditions will permit.

Our latest catalog covering this machine is at your disposal; kindly write for it.

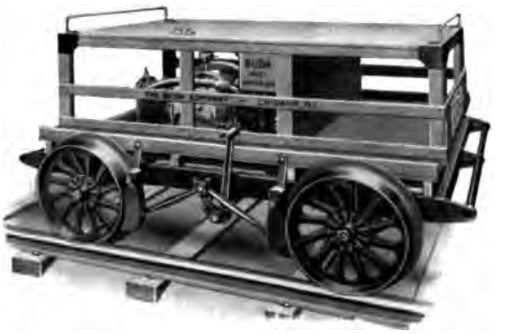
In regard to anything supplied by us to the railroads, we will gladly furnish detail information. This can be had by addressing the T. W. Snow Construction Company, General Offices, Ellsworth Building, Chicago, or to our eastern sales agents, Quincy & Gilman Engineering Company, 90 West Street, New York City, or to our western sales agent, L. P. Tolman, Central Building, Seattle, Wash.

The Buda Company

Buda No. 100. Inspection Motor Car, Nine Passengers

Buda No. 16. Inspection Motor Car

Buda No. 19. Section Motor Car



Buda No. 32. Section Motor Car

Buda No. 12-A. Inspection Motor Car

Buda No. 14-W. Bridge Gang Motor Car

Buda No. 11-A. Motor Velocipede Car

Buda No. 10-NH. Motor Velocipede Car

The Buda Company

THE Buda Company has been established for the past thirty years, and the policy of this company has been to build only the best, and the name "Buda" stands for High Grade Products all over the world. One of the principal articles that is manufactured by this company is railway inspection and section motor cars, and their long and extensive experience in the manufacture of such cars, and in the manufacture of automobile motors and transmissions, which they furnish to automobile manufacturers, has put them in the front rank of builders of gasoline motor cars for use on railroads.

The use of such cars in general is the most important question before the railroads at the present time, and demands very earnest and careful consideration on their part. It has been proven conclusively that the use of gasoline motor-driven cars for section purposes, for inspection use and for signal maintenance, has greatly reduced operating and maintenance expense, and the lengthening of sections by the use of such cars and the consequent reduction in the number of men has been a great item, and better work is performed by the men, as they do not have to exert themselves in getting to their work and returning as they would with hand-driven cars and velocipedes.

The chief requisite of any motor-driven car for such purposes is that it is ready for service and in service all the time. Therefore, it is of the greatest importance for any railroad purchasing such cars to select one that will be always ready for service, and so designed and constructed that it can be depended upon to be in daily operation, performing the functions for which it was purchased.

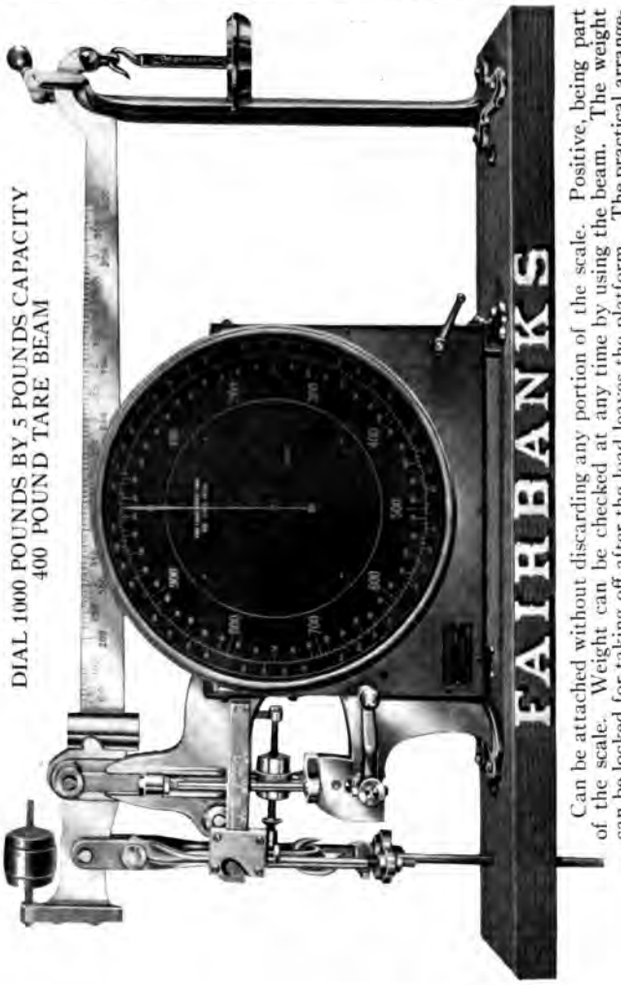
The car that is superior, having the best type of engine and transmission and general construction, naturally will cost the most, but this first cost is of no moment, considering the work that such a type of car will accomplish in comparison with a car of inferior design and sold at a lower price.

If a railroad has lengthened its sections and reduced the number of men for a certain mileage, basing its change on the fact that with a motor-driven car more ground can be covered and more and better work can be accomplished, it is a natural sequence that if the car that is purchased is not in daily service, and is laid up for repairs or renewals, that the system inaugurated by the purchase of motor-driven cars is demoralized, and where a section has been increased 50% or more and hand propelled cars have to be substituted when motor-driven cars are out of service, the work of maintenance and inspection must of necessity be crippled.

The Buda Company courts the most thorough investigation of the type of cars they offer and the details of their construction and design.

NEW YORK CHICAGO ST. LOUIS
W. A. GREEN, CAXTON HOUSE, WESTMINSTER, LONDON, ENGLAND

McFarlane Quick Weight Indicators



DIAL 1000 POUNDS BY 5 POUNDS CAPACITY
400 POUND TARE BEAM

Can be attached without discarding any portion of the scale. Positive, being part of the scale. Weight can be checked at any time by using the beam. The weight can be locked for taking off after the load leaves the platform. The practical arrangement of the pull being on pivots, removes all strain and wear from the working parts, and produces longevity. If anything happens to the indicator, your scale is not out of commission.

DIAL 1000 POUNDS BY 5 POUNDS CAPACITY

With Portable Scale complete of two capacities, one 400 pounds by 5 pounds, and one 300 pounds by 1 pound. Platform 20 by 28 inches for each scale. No springs.

ACCURATE—EFFICIENT—SUBSTANTIAL

McFarlane Manufacturing Co.

1669 Selby Avenue Saint Paul, Minnesota, U. S. A.

Fairbanks, Morse & Co.

General Offices
Chicago, Ill.
U. S. A.

Branch Offices
in All
Large Cities

Motor Cars

Engines

Pumps

See Our Exhibit at the Railway Appliances Show

Electric Motors

Coliseum, Chicago
March 17 to 21, 1913

Spaces 73 to 76 and 92 to 95

Generating Sets

Standpipes

FAIRBANKS-MORSE QUALITY LINES

- Fairbanks Scales
- Motor Cars
- Hand and Push Cars
- Velocipedes
- Track Drills
- Air Compressors
- Electric Light and Charging Plants
- Producer Plants
- Warehouse Trucks
- Oil Engines
- Gasoline Engines
- Steam and Power Pumps
- Boilers
- Marine Engines
- Gasoline, Steam and Electric Hoists
- Windmills
- Jacks
- Drawbridge Machinery
- Standpipes
- Water Stations
- Coaling Stations
- Pumping Outfits
- Generating Sets
- Chain Hoists
- Dynamos and Motors
- Turntable Tractors
- General Supplies

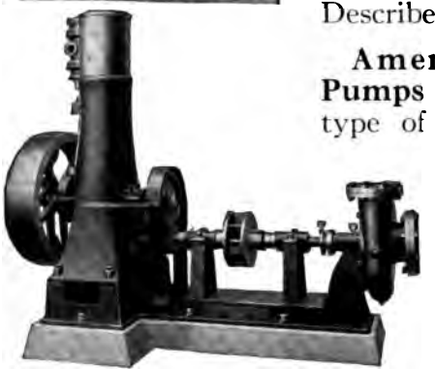
Pumps That Have Stood the Test of Time in Railroad Service

THE best possible evidence of the superiority of "American" pumps for railroad service is that the railroad companies that have been using them for many years are buying more of them at present than at any time in the past.

This is due to the facts that the quality and economy of the first pumps installed has been fully proved, that "American" pumps have always represented the highest achievement in pump design and that instead of attempting to adapt all conditions to a single style or type of pump "American" pumps are made in a large variety of types to meet every possible requirement.

"American" Centrifugals represent the highest development of the centrifugal principal of pumping. They are made in over fifty regular styles in any size to the largest built, and equipped with any power. They are described in Catalog 117.

American Turbine Centrifugals adapt the centrifugal principal of pumping to large-bore deep wells. Designed for actual lifts to surface to 250 feet. Described in Catalog 125.



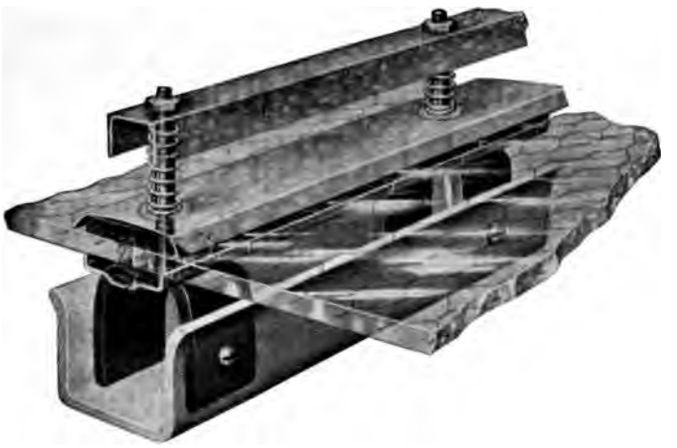
American Deep Well Plunger Pumps have been the standard of this type of pump for nearly forty years.

Made with single acting and double acting water cylinders and equipped with steam heads, pump jack or directly geared to motor. Described in Catalog 110.

Before you buy any kind of railroad pump, let us explain the superiority of the "American" line.

The American Wells Works:

General Office and Works, Aurora, Ill.
Chicago Office, First National Bank Building.



Anti-Pluvius

(Trade-Mark)

Puttyless Skylights

Patented

Specification

"Anti-Pluvius" puttyless skylights with copper (or galvanized iron) trimmings (one-fourth inch or three-eighths inch wire glass) and flashings above the curbs, as furnished by The G. Drouvé Company, Bridgeport, Conn.

Tight and permanent skylights insured under this specification and a square deal.

"Anti-Pluvius" skylights are practically designed and accomplish their purpose. Installed under right conditions which concern pitch, supports and size of glass, being flexible and accessible they are economical and satisfactory.

Look at our installations anywhere for proof.

Typical Installations: Converse Art Gallery, Norwich, Conn.; Fifth Avenue Office Building, New York, N. Y.; West Technical High School, Cleveland, Ohio; Arcade, Columbia, S. C.; Market House, Toledo, Ohio; South Boston Power Station, Boston Elevated Railway.

"Straight-Push" Sash Operator

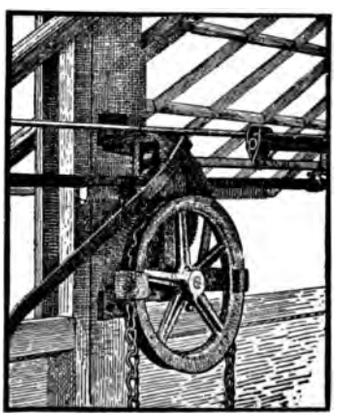
Patented

Specification

Furnish and erect "Straight-Push" sash operator manufactured by The G. Drouvé Company, Bridgeport, Conn., where shown on the plans. The lines drawn through sash designate length of runs and number of sash to be operated in each instance.

Certain operation of sash with leverage force applied at each; tight sash when closed. Strong, durable material to stand man-handling makes the combination of "Straight-Push" sash operator the most effective device for the purpose. Standard in price and quality. Sash handled in runs up to 100, 150 or more lineal feet. Easy and dependable control.

Our long service installations offer proof of efficiency and economy.



Typical Installations: Coney Island Bath House; Solvay Process Co.; American Steel & Wire Co.; American Radiator Co.; N. Y. C. & H. R. Rd.; Southern Ry. Co.; D., L. & W. Ry.

The G. Drouvé Company

Bridgeport, Conn.

180 North Dearborn Street - - Chicago, Ill.

Des Moines Bridge & Iron Co.

ONE of the most vexing problems to be solved in railway operation is that of water storage. The first essential for a storage structure is large capacity, eliminating to a great extent dependence upon continuously operated pumps. The second essential is low cost of maintenance, usually considered of more importance than low first cost. In northern climates, freedom from troubles due to freezing is necessary. A pleasing appearance is to be desired. Therefore a structure which most completely meets these requirements, which is correctly designed, and properly manufactured and erected, merits the favorable attention of those interested in efficient railway operation.

"DES MOINES" RAILWAY-TYPE STEEL WATER TANKS are the result of twenty years' experience in water storage applied to the solution of the problem stated.

"DES MOINES" TANKS are designed by competent engineers, and have the maximum storage capacity with the minimum range of head.

"DES MOINES" TANKS are manufactured in the PITTSBURGH DISTRICT, which insures minimum transportation expense, and prompt deliveries.

"DES MOINES" TANK BOTTOMS are fabricated with specially designed machinery which does not impair the elasticity or strength of the metal.

"Des Moines" Tank, 100,000 Gallons Capacity
Built for Northern Pacific Ry. Co.

"DES MOINES" TANKS are of pleasing appearance, both to the traveling public and to the engineer.

"DES MOINES" TANKS are proof against freezing and operate the year around.

"DES MOINES" TANKS remove all sediment from the water and can be cleaned without interfering with the service.

"DES MOINES" TANKS cost less than wood, when their long life is considered.

"DES MOINES" TANKS cost little to maintain, they NEVER LEAK, and they NEVER FAIL.

Booklet "O" furnished on application

Des Moines Bridge & Iron Co.

WORKS

Neville Island, Pittsburgh, Pa. Ninth and Tuttle Sts., Des Moines, Ia.

OFFICES

Curry Building, Pittsburgh, Pa. Ninth and Tuttle Sts., Des Moines, Ia.

U. S. Wind Engine & Pump Co.

BATAVIA, ILLINOIS

Railway Water Appliances

FOR nearly sixty years this company has been making devices for the handling and storage of water.

Their WINDMILLS, of either wood or steel, are of the highest type in mechanical construction and efficiency. Modern improvements make them SELF GOVERNING in bad storms, and automatic in action. Their WINDMILLS form an economical power for pumping water as an auxiliary to gasoline engine at small water stations, as well as a dependable water supply for stock yard purposes.

The U. S. WIND ENGINE & PUMP COMPANY make a full line of HAND PUMPS for station platforms, stock yards, cisterns, etc. The famous Double-Acting Railway Curtis Pump is exclusively their product. Railroads all over this country and abroad have used the CURTIS POWER PUMP for nearly half a century and found them to be efficient, economical of maintenance and capable of being used under a wide variety of conditions.

WOODEN WATER TANKS is another thing manufactured by the Company. So long have they been making tanks that their method and the "U. S." Tanks have become a sort of standard by which all other tank work is gauged. The best grades of Soft White Pine, Clear Red Louisiana Swamp Cypress and Washington Fir lumber are used. Only genuine wrought iron is employed in the manufacture of the hoops. The latter are made in flat, round or half-round sections. Standard shapes and sizes are carried in stock.

It is claimed that the U. S. Wind Engine & Pump Co. annually turn out more Railroad tanks than all other manufacturers combined.

TANK FIXTURES, including Spouts, Indicators, and all appurtenances for gauging and delivering water to and from the tanks, are manufactured and marketed by this concern. Standard devices, peculiar to individual railroads, are also made by the company.

STEEL TOWERS, for supporting and elevating tanks of all sizes form an important feature of the U. S. W. E. & P. CO.'S business.

The CONSTRUCTION IN THE FIELD by contract, of any of their products so as to turn them over complete to the consumer ready for service, is also an advantage to the purchaser in many instances.

WATER COLUMNS or STAND PIPES made by this company are well known on every railroad of any size. The Mansfield Water Column, for twenty years the old dependable pen-stock in all climates and for all conditions, has been improved until it is the best column with direct acting valve on the market to-day. It may be equipped at the pleasure of the purchaser with either rigid or adjustable spout.

The U. S. WATER COLUMN with automatic hydraulically operated valve, is the latest and most modern device of its kind. It is also possible to use either style spout with this valve. Anti-splashers, self-locking devices and slow-closing valve attachments, are also accessories that may be applied as desired.

SWITCH-STANDS, SEMAPHORE SIGNALS and SEMAPHORE SWITCH STANDS, both high and low, make a comparatively new departure for this company. With its fine foundry and machinery equipment, this line was added about five years ago, with marked success.

To any railroad man appreciating simple, strong construction combined with the finest workmanship, these devices will appeal.

SIMPLEX JAX FOR CARS AND TRAX	FOR CARS AND TRAX SIMPLEX JAX	SIMPLEX JAX FOR CARS AND TRAX	FOR CARS AND TRAX SIMPLEX JAX
FOR CARS AND TRAX SIMPLEX JAX	SIMPLEX JAX FOR CARS AND TRAX	FOR CARS AND TRAX SIMPLEX JAX	SIMPLEX JAX FOR CARS AND TRAX
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FOR CARS AND TRAX SIMPLEX JAX	SIMPLEX JAX FOR CARS AND TRAX	FOR CARS AND TRAX SIMPLEX JAX	SIMPLEX JAX FOR CARS AND TRAX

"Speak for yourself, Jack"

With apologies to Longfellow

It Speaks for Itself,
with apologies to no one

Templeton, Kenly & Co. (*Ltd.*) Manufacturers Chicago :: Toronto

Ogle Construction Co.

Coaling Station of Timber Construction
Serving two tracks on one side

All-Steel Coaling Station
Serving two tracks

THE Ogle Construction Co. make a specialty of designing and building Locomotive Coaling Stations, either of timber construction or entirely of steel and concrete.

Their machinery has been developed along with the bucket type coaling station, and represents the most approved apparatus for the purpose now on the market. No pains or expense has been spared to make their entire equipment the most reliable, efficient and dependable that it is possible to produce.

By the use of automatic measuring feeders and automatic reversing hoist the coal is elevated without the attention of the man in charge, leaving him free to attend to other duties about the plant while the coal is being elevated.

At space 15 in the Coliseum they will exhibit a one-eighth scale model of an all-steel Coaling Station, with all their latest improved machinery. Every railroad man interested in fuel handling should visit the Ogle Co.'s exhibit when in Chicago attending the convention of the American Railway Engineering Association. The Ogle Construction Co.'s offices are located in the McCormick Building, 332 S. Michigan Ave., Chicago.

The Joyce-Cridland Co.

DAYTON, OHIO

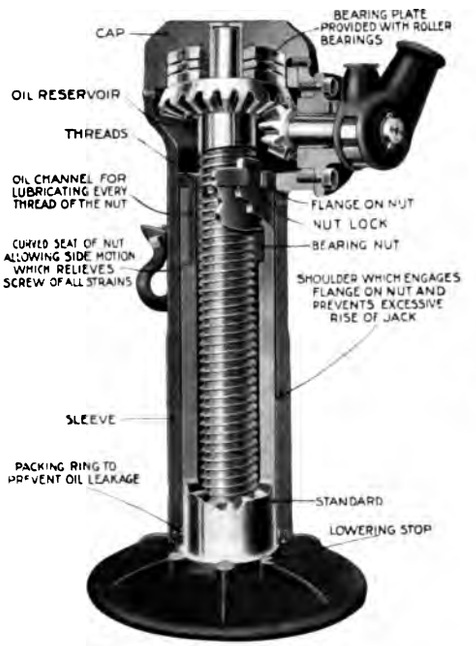
Makers of

High Class Jacks for Every Railroad Use

All Steel with Phosphor Bronze Nuts

Planed and Hardened Nickel Steel Gears

Ground and Hardened Rollers and Bearings



Geared Screw Jack

Highest Possible Speed with Screw-jack Safety

Screws, Gears and Bearings run in oil

Fifteen to One Hundred Tons Capacity

Broad Base Hydraulic Jack, 15 to 60 tons capacity.

The aim in designing "JOYCE" jacks has been to produce substantial and reliable devices of great power and few working parts from the best of materials and workmanship.

Every "JOYCE" jack is carefully tested and inspected at the factory, and is guaranteed to lift its rated capacity, having a factor of safety of fifty per cent overload.

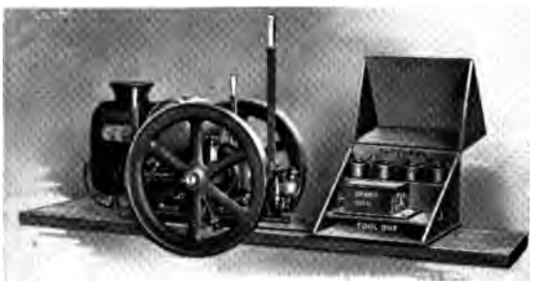
Full Automatic Geared Lever Jack, 35 to 50 ton capacity.

The Mighty Fairmont

GASOLINE MOTOR-CARS AND ENGINES FOR MOTOR-CARS OF EVERY KIND

Roadmaster's Inspection Car

Our Standard No. 1, Every Purpose Car



Our Engine for any Hand-Car

Our 3 Horse Engine pulling a push car, 30 ties, 5 men up grade and made a speed of 10 miles per hour.

THE NEW FAIRMONT ROADMASTER'S INSPECTION CAR

Light and short enough to put into any baggage car. Seats reversible, to face either way. Engine reversible, to run either way on the track without turning car around.

The car is equipped with the 3 horse-power Fairmont Special for Roadmaster's work.

Fully adjustable for slow running, speeding, or pulling a load, and you don't have to push the car to start.

GUARANTEE

EVERY ENGINE GUARANTEED THREE YEARS AGAINST DEFECTIVE MATERIAL AND POOR WORKMANSHIP

OUR SPECIAL SLIDING BASE

(Patent Applied For)

The "Fairmont" Hand-car Engine is furnished with a special SLIDING BASE, worked by an adjusting lever, which enables the operator to free the engine for a quick stop, or to start a heavy load without pushing the car, and admits of a quick change of pulleys and speeds. This gives a free engine, the same as all automobiles and the latest motorcycles have.

COMPLETE MOTOR CARS

GREAT POWER LITTLE WEIGHT

Main parts enclosed against dust and grit.
Removable water jacket. Long bearings.

We want the privilege of giving you any information about this engine and what it will do. It is no experiment. In use more than four years this October, 1912.

No matter what any other engine is said to do, we have won 71 competitive tests—on speed on track, use in cold weather, what it will pull, its reversible features, its adjustability from slow to high speed and consumption of gasoline.

Get our circular matter. Get thoroughly posted, and let us help you to overcome the obstacles of the work of the section gang.

Our 3 horse-power is a mighty engine.

Our 5 horse-power is for heavy work and for bridge gangs.

THE FAIRMONT GASOLINE ENGINE

With a Fairmont Gasoline Engine you can change your old Hand-Car into a Modern Motor-Car in two or three hours.

Our 3-H. P. Outfit Includes the Following:

One 3-inch pulley and one 5-inch pulley for engine, one 14-inch wood split pulley for car axle, drive belt and fasteners, battery, spark plug, spark coil, spark plug wrench and one-half gallon can of lubricating oil.

One man can handle it on and off the track. Has the Hit-and-miss governor, the best automobile carbureter and spark coil that money can buy, making it perfectly flexible and adjustable, and it will run on one-third less gasoline than any engine made doing the same work.

Has won every test (lost none) for cold weather in the North or the hot weather in the South—it has made no difference; the engine simply can't be beat.

Get our published matter and see what we give you.

The engine furnished complete, with full instructions for cutting car down and seating.

The engine furnished complete, including the seats, with full instructions for cutting car down and attaching seats.

The car furnished complete as shown. Ask us for prices.

We Make Engines for Every Purpose
2, 3, 4, 5, 6, 10 Horse-power

MANUFACTURED BY

Fairmont Machine Company

Incorporated

FAIRMONT, MINNESOTA, U. S. A.

Our Motto: "Meet every requirement" We Can Help You

The Adams & Westlake Company

Adlake's the Answer

THE quality of the products of The Adams & Westlake Company is so well known by railroad men that for the convenience and reference of those who have attended the National Railway Appliances Association exhibition, and for the information of those who are unable to attend, we list below a general indexing of the products which they manufacture.

Balances, Sash, Car.
Bells and Gongs, Car.
Bolts, Door.
Brakes, Car, Hand.
*Burners, Long Time—Bulletin B-17.
The use of long time burners is recognized as giving a considerable saving in oil and in the cost of care.

*Burners, High and Low—Bulletin B-20.
No. 0. Interchangeable with long time and signal burners.
Bushings, Bell Cord.
Castings, Aluminum.
Castings, Brass and Bronze.
Castings, Bronze, Phosphor.
Catches, Cupboard.
Chimneys, Headlight.
Chimneys, Lamp.
Closets, Car.
Closets, Postal Car—Bulletin C-3.
Meeting the requirements of the circular of specifications issued by the Post Office Department under date of July 7, 1911.

Closets, Car, with Collar and Ventilator—Bulletin C-8.
Cocks and Bibbs, Compression.
Cocks and Bibbs, Self-Closing.
Cords, Bell, Braided Cotton.
Couplings, Bell Cord.
*Cuspidors, Sherardized Steel—Bulletin A-4.
Will not rust. Made with Sherardized steel or white Ajax Metal cover.

Door Fittings, Car.
Faucets.
Fittings, Car, Lavatory.
Fixtures, Car Lighting—Supplement A.
Illustrating one line of car fixtures.

Fixtures, Car Vestibule.
Globes, Lamp and Lantern.
Guides and Strap Hangers, Bell Cord.
Handles, Brake or Controller.
Handles, Brake, Ratchet.
Handles, Grab, Car Platform or Vestibule.
Hangers, Bell Cord—Bulletin C-5.
Will not sway, can be swung in any direction. No strain on the ceiling of the car.

Hangers, Door, Car.
Hangers, Self-Oiling.
Hardware, Car.
Headlight Reflector Replating.
Headlights, Car, Electric.
Headlights, Locomotive, Acetylene Gas.
Headlights, Locomotive, Electric.
Headlights, Locomotive, Oil.
Hinges.
Hinges, Door, Spring.
Holders, Car Door.
Holders, Locomotive Inspection Card—Bulletin C-2.
Standard for Interstate Commerce Commission Inspection cards.

Hooks, Coat and Hat.
Knobs, Door, Brass and Bronze.
Lamps, Acetylene.
Lamps, Car.
*Lamps, Coach, Tail—Bulletin B-5.
Fresnel lens, 90 degrees of rear signal divergence. Adlake Non-Sweating Balance Draft Ventilation.

*Lamps, Engine Classification—Bulletin B-18.
Standard coach marker with a new "Style S," bracket that permits being used either as right-hand or left-hand lamp. Adlake Non-Sweating Balance Draft Ventilation.
Bulletin B-19,—No. 83 Round Body Steel Marker or Tail Lamp, with one, two, three or four lenses, colors as desired. Minimum maintenance expense, maximum signalling efficiency.

*Lamps, Engine Classification.
*Lamps, Indicator, for Locomotives or Cabooses—Bulletin B-3.
Adlake-Small Train Indicating Lamp facilitates train movement, number of train clearly shown, makes quick identification possible from any direction.

Lamps, Railway.
*Lamps, Semaphore—Bulletin B-6.
No. 180. Conforming to the R. S. A. Standard Specifications

Lamps, Semaphore, Convertible—Bulletin B-22.
No. 117. Provides a dependable oil auxiliary.

*Lamps, Signal.

Adlake's the Answer—Continued

*Lamps, Switch—Bulletins B-11, B-12, B-14.
No. 175 with 28-ounce oil fount. Adlake Non-Sweating Balance Dratt Ventilation.

*Lamps, Station.

*Lanterns, Railway—Bulletins B-2, B-9, and B-23.
The Adlake Reliable Encased Oil Pot Lantern, outside wick raiser, removable top globe holder, rigid or swinging bail lock.

Latches, Cupboard.

Lavatories, Car.

Lavatories, Car, Enameled Iron.

Lavatories, Car, White Metal—Bulletin A-1.
White Ajax Metal never requires replating, also retains original lustre.

Lavatories, Dental—Bulletin A-2.
No. 200 White Ajax Metal Dental Lavatory. Entire surface of bowl flushed, drain openings will not clog.

Lavatories, Folding.

*Lenses, Semaphore and Signal Lamp.

Lifts, Sash.

Lighting, Car, Acetylene.

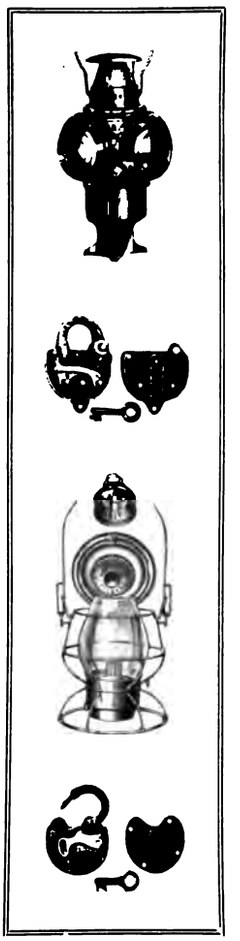
Lighting, Car, Electric.

Linings, Head, Car.

Locks, Car.

Locks, Catches, Hinges and Handles, Passenger Car—Bulletin C-9.
No. 776 Vestibule (Swing) Latch. Strongest and easiest locking latch for vestibule doors.

Locks, Sash, Car—Bulletin C-1.
Can be used either as right-hand or left-hand.



*Locks, Signal Box—Bulletin C-7.
Controlled by four tumblers and a bridge plate. Shackle bolt pivoted, cannot be jarred open. No. 650.

*Locks, Switch, Railway—Bulletin C-6.
Sherardized Steel Switch Lock. Cannot rust, practically non-pickable. No. 48.

Lights, Contractors' Acetylene.

*Padlocks.

Pumps, Brass.

Racks, Hat and Baggage—Bulletin C-4.
Rod Bottom. Can be made up in continuous lengths or in separate sections. Take down feature for renewing or repairing in sections.

Ratchets, Deck Sash.

Ratchets, Roller, Deck Sash.

Sash Openers, Deck.

Signs, Car.

Springs, Seat, Car.

Stops and Holders, Car Door.

Straps, Hand, Car.

Tanks, Water, Car.

Trimmings, Car.

Ventilators, Car.

Wash Stands.

Window Operating Devices.

Send for a complete list of our bulletins and have your name placed on our mailing list to receive our regular bulletin service.

*Indicates that the product so marked will be on exhibition in spaces Nos. 83, 84, 102, and 103 at the Coliseum.

MAIN WORKS AND GENERAL OFFICES
Ontario, Orleans, Ohio and Franklin Streets, Chicago

EASTERN WORKS AND MAIN EASTERN OFFICES
Philadelphia, Pa.

The Adams & Westlake Company

ESTABLISHED 1857

CHICAGO
Mail Address
319 W. Ontario Street

PHILADELPHIA
Mail Address
2218 Ontario Street, Station R

NEW YORK CITY
Mail Address
1000-1-2 Hudson Terminal Bldg., 30 Church Street

Three Important Factors in Railway Engineering

ELECTRIC RAILWAY JOURNAL

Established in 1884, no other publication has so thoroughly, completely and exclusively represented the field it serves. Circulation 8,000 copies.

FROM the days of one-horse power cars, running on two streaks of rust, to the era of 400 horse-power interurbans operating on 100 lb. rail, the **ELECTRIC RAILWAY JOURNAL** has been an integral part of city and interurban transportation development.

Now, as it has been for twenty-seven years, it is an indispensable means of keeping abreast of every advancement in the construction, equipment, maintenance, and operation of electric railways.

The **JOURNAL'S** descriptive and technical articles thoroughly cover such subjects as:

1. Steam Railroad Electrification
2. Track Construction and Maintenance
3. Overhead and Third-rail Construction
4. Transmission Lines and Sub-Stations
5. Signaling
6. Power House Design, Equipment and Operation

Electric railway operation and finance, as well as matters of engineering interest, are given equal attention in the **JOURNAL.** These features, together with its complete news service, cover every activity of the industry.

Foreign improvements and practice in equipment of operation are reported by special correspondence. No other technical journal, it is believed, prints so large an amount of exclusive and diversified matter having important relation to the progress of the industry with which it is identified.

The editorial service of the **JOURNAL** also comprehends the interests of manufacturers of electric railway equipment and supplies, and its advertising pages are virtually a complete weekly guide to everything consumed by electric railways.

ENGINEERING RECORD

Devoted to civil engineering and contracting, and covering this broad field with unequalled thoroughness and authority. 18,250 circulation.

GREAT opportunities are presented today to the civil engineer in the broad and rapidly developing railroad field. To grasp these opportunities and attain the highest degree of success in his work, he must, together with broad ideas on general civil engineering, equip himself with specialized knowledge to a larger extent than ever before. It is to this end that the **ENGINEERING RECORD** is of the greatest possible assistance to the civil engineer.

The live problems of the railroad civil engineer are given special attention in the **ENGINEERING RECORD,** and at the same time there is laid before him much additional general data of an exclusively civil engineering character which is invaluable as a sidelight and aid in his own broad work. The experience of other railroad engineers is brought out through this journal's plan of encouraging its readers to be contributors also, and in addition, accounts are given of important current work; and material of value is presented from the discussions of the various societies in the field. Practical helpfulness to the engineer in his daily work is sought in every article.

Developments in construction and maintenance practice are brought to the attention of the railroad engineer, and he is kept abreast of progress on such important current matters as grade-crossing work in cities, terminal development and freight-handling facilities, special features of management of engineering forces and departments, educational work among employees, and the many maintenance problems, including wood preservation, tie and rail wear, etc. The **ENGINEERING RECORD** is a paper which is not left lying in the office with the wrapper on it. Progressive railroad engineers **read** it.

ELECTRICAL WORLD

For 37 years the leading electrical journal, it circulates 20,000 copies among the men of thought and action in every department of the industry.

MUCH of the data and information regarding the application of electricity in transportation is not to be found in books. It may be years before some important discovery or development becomes a part of standard practice. Nevertheless, the engineer best equipped to decide, as he must, for the present, is one who has all the knowledge available of the possibilities of the future.

In the **ELECTRICAL WORLD** is reported every development of potential worth, frequently in advance of practical application, but never behind the best practice of the art. This applies to foreign and American advances in electric railroading, as one of the whole range of subjects involving the generation, transmission, application, and sale of electricity.

The application of alternating-current-motors, the increase in direct-current voltage, electrification of steam roads, storage battery and gasoline-electric cars, are typical examples of the subjects treated promptly and comprehensively in a manner to satisfy the highest technical requirements.

In the utilization of high voltage for long-distance transmission the **ELECTRICAL WORLD** has always led the electrical press not only of this country but of Europe. Its readers are kept fully posted concerning methods for predetermining not only the electrical, but also the mechanical characteristics of transmission systems. Every detail of power-house design is, of course, fully treated.

The **ELECTRICAL WORLD** is, and since its establishment in 1874 has always been conceded to be, the foremost electrical journal in any language.

The subscription price of each of the above publications is $3 yearly; $4.50 in Canada; $6 in foreign countries.

Published weekly by the
McGRAW PUBLISHING COMPANY,
239 West 39th St., New York

The Railway and Engineering Review

Weekly—Every Saturday

Established 1868—Forty-fourth Year

The only technical weekly railway journal published west of New York.

Most readable and most read, most practical, most independent, most vigorous, most prompt, complete and correct in its news, most evenly and thoroughly circulated in the United States and adjoining countries.

The Review asks only to be judged by its contents and its policy—by what it is and what it does, and the esteem in which it is held by the most intelligent railway men.

It is an institution built up on merit—not an aggregation or consolidation—not an organ—not controlled or influenced by entangling ownership or alliances. Notwithstanding statements made daily for many months, the Review *has not been sold, has not been offered for sale, and is not for sale.*

The Review offers fullest information and opportunity for investigation as to its circulation and standing.

It has been continuously under one management for almost an ordinary lifetime; and that management has received more recognition and appreciation from the highest sources than has ever been extended to any individual or group of individuals in railway journalism anywhere in the world.

If you wish to read the best; if you wish to feel that what you are reading is not inspired or influenced by proprietary interests; if you want to read a journal which seeks the truth only and the best interests of railways; that stands for the best things in railway operation and management; that has the courage to say what it believes; and that has the respect and commendation of the highest railway officials—you will read

The Daily

of the

March Convention and Exhibition

is published by

The Railway and Engineering Review

It was first in the field, and its success has not been impaired by competition.

It is a daily for the day—for the convention and the exhibition. Issued and circulated early every evening, it is received and read by everyone attending the convention and the exhibition. A morning paper comes with warmed-over matter, the day after.

A canvass conducted by independent parties for their own purposes at the gathering of March, 1912, showed by overwhelming majority that the Review Daily was the most popular. People at home do not care to get convention dailies and rarely open them. The regular weekly issue of The Railway and Engineering Review contains the full record of the convention proceedings and the exhibition. *The Daily is the life of the Convention and the Exhibition.*

To get the best advertising value, use the columns of the Daily, and special space in the issues of the Weekly Railway and Engineering Review immediately preceding and following the convention.

The Daily is conducted to help the advertiser. His advertisement is with the reading matter—not segregated for easy destruction and inevitable neglect. And the railway men like this plan. *See what they say on the following page!*

Get the full value of exhibiting by the most intelligent use of printers' ink. Let us give you our rates; and show you why the Review is the Live Wire which makes any other supernumerary.

The Railway and Engineering Review

Office of Publication, Chicago. Subscription, $4.00 a year.

Resolution

adopted by the

Thirteenth Annual Convention

of the

American Railway Engineering Association

Resolved, by the Members of the American Railway Engineering Association in Convention assembled, that we desire to place on record our hearty appreciation of the efforts made and the admirable results obtained by the

Railway and Engineering Review

in its daily issue during this Convention.

Resolved, that the cordial thanks of the Association be extended to its managing officers and editorial staff.

Resolved, that a copy of these resolutions be spread upon the Minutes of this Convention and a copy transmitted to the Railway and Engineering Review.

President.

Secretary.

CHICAGO

Spencer Otis Company

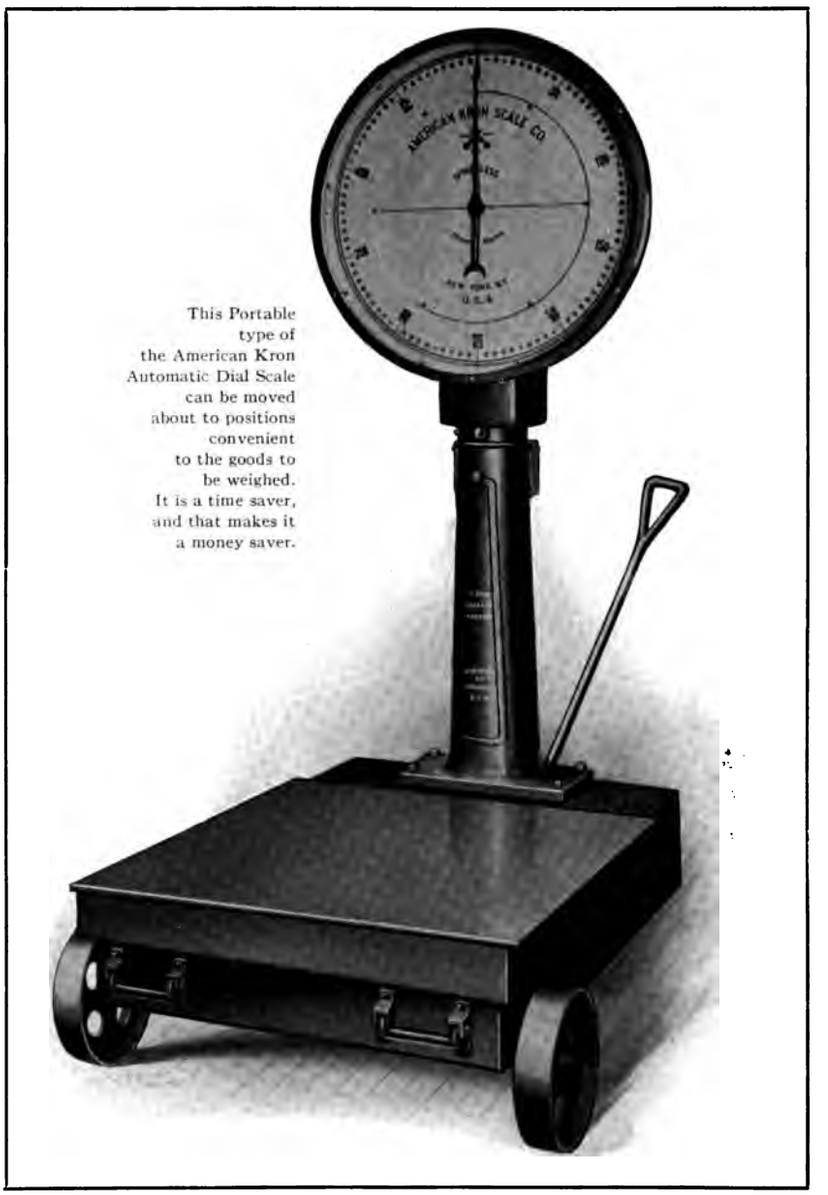
ST. LOUIS

American Kron Automatic Dial Scale

IN the vast commercial systems of today, the saving of time means the saving of money, regardless of where the time is saved. The elimination of any unnecessary work is also synonymous with the saving of money.

The old-fashioned method of weighing goods by spring balances and sliding weight scales was slow and inaccurate. Correct results were only to be had from a dependable weighing clerk, and even then the weighing process was always subject to doubt.

Overweight largely reduces the profits of merchant and manufacturer; it upsets his entire business policy and often removes the profit from certain sales. Underweight causes endless correspondence, and stirs up the bad feeling that loses customers. The Kron is an automatic dial scale expressly designed to meet the increasing demand of industrial concerns and transportation companies for an automatic, instantaneous, accurate weighing machine. It is springless—has no springs to expand and contract, nor pivots to wear down. The amazing speed with which weights can be obtained and read on a Kron Scale means an enormous saving of time—that is, money.



This Portable type of the American Kron Automatic Dial Scale can be moved about to positions convenient to the goods to be weighed. It is a time saver, and that makes it a money saver.

With the Kron there is no chance for guessing, fumbling or balancing. It is easy to weigh a 10-pound package one instant and a 500-pound package the next. Neither incapable man nor ineffective machine can cause you loss—the Scale does all

CHICAGO **Spencer Otis Company** ST. LOUIS

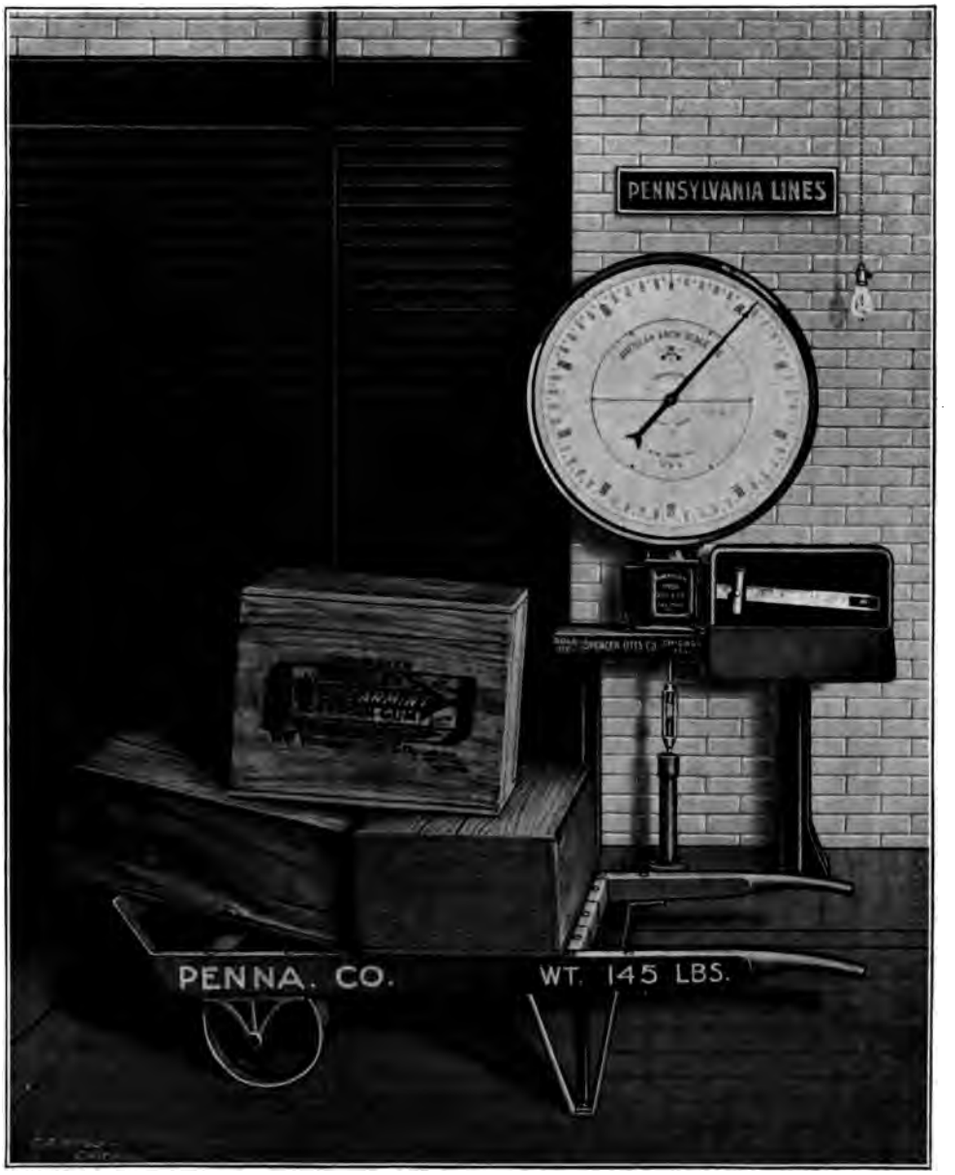
American Kron Automatic Dial Scale

the weighing and deducts tare weight, too, when desired.

This satisfactory scale is made in form and capacity to suit every requirement of railroad companies. Existing styles include the Dormant Warehouse, Portable Platform and special Baggage and Freight and Express Scales. It is only necessary to place load on the platform and read the big, clear Dial — that's all there is to weighing with a Kron Scale. The "dead beat" pointer-hand instantly shows the correct weight. Scale will weigh goods as fast as they can be handled and is always ready for the next job. By using the Tare-Beam net weights are instantaneously given on Dial.

The Kron Attachment can be applied to any Beam and Platform Scale now in use, and has been adopted by leading express and railroad companies East and West. Forty-two Krons are in one express office, seventeen in a single railroad freight warehouse.

Railroad companies are generally the first to adopt economical and efficient methods. Their operating problems make it necessary to do this. That they appreciate the time-saving and money-saving qualities of the American Kron Scale is well illustrated by the number of installations which have been made in railroad service.



This shows the American Kron Automatic Dial Scale in operation on the Pennsylvania Lines.

CHICAGO

Spencer Otis Company

ST. LOUIS

American Kron Automatic Dial Scale

The Kron scale is the only one that is automatic in the true sense. The importance of this to railroad companies is obvious because it is a guarantee of time saving. The saving of time means the saving of money. A truly automatic scale also means a further saving because of accuracy. It is simplicity itself, for with the Kron scale all that is necessary is to load and look at the dial.

While demonstration rooms are maintained by Spencer Otis Company in both their Chicago and St. Louis offices, for the benefit of the railroad officials who have not had an opportunity to investigate the merits of the scale, it will be on exhibition in spaces 122, 141, 142 and 143 at the exhibition at the Coliseum, March 15th to 21st. Much fuller information in regard to the scale, its design and construction, where it is in use, and who its satisfied users are, will be gladly furnished by making request to the Spencer Otis Company's office in the Railway Exchange Building, Chicago.

This shows the American Kron Automatic Dial Scale in operation on the Wabash R. R.

Columbia Batteries

A TRACK BATTERY WHICH CANNOT FREEZE

Install these batteries (no wells necessary) and give your maintainer time to attend to other work besides renewals.

Simplicity and *Reliability*
Economy and *Adaptability*
That Tells The Story

We have some literature brim full of general information useful to signal engineers. Write for it.

You Can't Beat These Dry Cells For Railroad Work

Old Reliable

It lasts for years. Use it for all general service and dispatching systems.

Best by Test

Delivers a snappy, reliable, regular spark, to operate your motor cars, gas engines, velocipedes.

No extra charge for Fahnestock connections

The Cell of Strength

An all 'round A-1 cell. You can't go wrong when you order it.

National Carbon Company

CLEVELAND, OHIO

THOMAS A. EDISON

Edison-Bsco Primary Battery

"The Standard Closed Circuit Cell."

EDISON-BSCO Type 401 Cell.

Complying with the specifications of the Railway Signal Association.

Automatic block signal mileage shows a healthy growth, significant of the favorable impression made by this form of block protection on railway managers.

The confidence thus indicated is unquestionably due to the present high efficiency of the electric semaphore; however, as the source of current is the soul of the block system, some facts concerning the battery commonly used will be interesting.

Edison Primary Battery supplies the current for operating more block signals than any other source of energy. Indeed, it is altogether probable that the total of automatic semaphores operated by all other electrical sources combined is less than the number operated by Edison Primary Battery.

Its importance as an aid in the growth of signaling is recognized, for the reason that it reduces the first cost of an installation to a much lower figure than any other current source of equal reliability.

EDISON-BSCO PRIMARY BATTERY—*Continued*

Its use carries with it the extremely desirable feature of a separate power plant for each signal, thereby eliminating the danger of a power failure putting a long stretch of signals out of service.

The cost of up-keep is very low, the cells requiring no attention from one renewal period until the next, this averaging a year on most railroads.

Tests made by various companies demonstrate that for ability to maintain voltage throughout its entire life, and uniformity of product, the Edison Cell is without a serious rival in the primary battery field; these essentials being assured by correct design, scientific manufacturing methods and a comprehensive inspection system.

The two features just mentioned, ability to maintain voltage and uniformity of product, are of paramount importance, for without them signal operation is rendered unreliable, and a signal system that is frequently in trouble is little better than none at all.

The use of Edison Battery begets a feeling of security which the lapse of time serves to strengthen, and the reason for the universal use of this product is apparent.

Complete EDISON-BSCO Renewal.
A more simple provision for recharging a battery would be difficult to imagine.

Thomas A. Edison, Inc.

Orange, N. J.

THE EDISON PLANT, ORANGE, N. J.

Copper Clad Steel Wire

A Committee from the Railway Signal Association visited our mill some time ago, and this is what they saw—

Steel billets, about thirty-six inches long, were pickled, washed and put in a special furnace. From this they were drawn up into a mould and carried to a second furnace.

This furnace contained molten copper at a very high temperature, and into this the steel billet was lowered and allowed to remain until its surface softened and formed

PUTTING ON THE ALLOY COATING

with the copper a copper-iron alloy; the alloy being very thin, just a surface coating on the steel.

The billet was now again drawn up into the mould, moved over to another furnace, where billet and mould were seated on a flange and pure electrolytic copper cast into the mould.

When the copper solidified, the mould was removed and, after heating, the billet, originally eight inches square, was rolled to a $\frac{3}{8}$-inch wire rod and then drawn cold to the required size of wire.

Copper Clad Steel Wire—*Continued*

The Committee had the rolling stopped at various points and made tests of weld, because,

Unwelded copper and steel are quickly destroyed by electrolysis.

"Copper Clad" steel wire means a wire of *welded* copper and steel and is the "trade name" of the copper-steel wire manufactured by the Duplex Metals Company. Back of the wire, and the name, is our guarantee, and back of the guarantee are five million dollars.

CASTING THE COPPER AROUND THE STEEL BILLET

There are tons of Copper Clad wire and Copper Clad bonds in use by the railways of this country and every pound is giving satisfactory service and saving money.

But when *you* order Copper Clad, be sure you get "Copper Clad." *Unwelded* bi-metallic wire is *not* "Copper Clad."

Trade Mark
Weld Clad

Duplex Metals Company

Chester, Pennsylvania

CHICAGO OFFICE:
853 Peoples Gas Building

NEW YORK OFFICE:
30 Church Street

BRYANT ZINC COMPANY

1895 The date sounds, at first hearing, like yesterday, so swiftly the years pass. Yet the year eighteen hundred ninety-five, when the Bryant Zinc Company was organized, is a full half-generation behind us, and this same eighteen years, measured by scientific advancement, is actually the longest similar period in history.

An illustration or two: It was in 1892 that James Gordon Bennett offered a prize for "the best practical horseless vehicle"—and a well-nigh horseless civilization is one of the triumphs of the years following.

Wireless telegraphy, in those same days, would have been accounted impossible of realization by any save such prophetic investigators as Professor Hertz and those who followed up his development of the wave-theory.

Still more recent has been the relative perfection of the aeroplane; and, as a matter of fact, every field of science, theoretical and applied, has expanded just as amazingly—so that today it is the skeptic who is jeered at, and the word "visionary" has lost half its old-time application.

During this same period more and more safeguards have been thrown around railway travel, so that a journey by rail today is a very different thing to what it was even at the end of the Nineteenth Century. Thus the Bryant Zinc Company, keeping pace with the progress of the times, has come to stand for a wide line of products and appliances which the name of the concern falls far short of indicating.

This development, however, has been logical and consecutive. Starting in, eighteen years ago, in the manufacture of battery zincs and coppers, the company's business speedily became tributary to the railway signal industry, and so, with all expansion and enlargement, it remains to the present day.

From manufacturing the simple elements of a primary battery to providing the battery complete—and the chemicals, hydrometers, and battery apparatus necessary for maintenance—was a short step. Quite as naturally followed testing instruments; voltmeters, ammeters, volt-ammeters, rheostats, and such like, for laboratory and field use—then linemen's tools and material for installation.

The Bryant Zinc Company always has held consistently to the policy that, having built its reputation on the quality of the line it originally manufactured, that reputation must not be impaired by adding to the list of its own standard products articles of perhaps indifferent merit, simply for the unsubstantial reason that it might call them *its own*. Better a sales agency for an article of approved merit than such a compromise for false pride's sake.

Consequently we see this company introducing widely such standard products as

BRYANT ZINC COMPANY

those of the Fibre Conduit Company, the primary batteries of the Waterbury Battery Company, measuring instruments of the Keystone Instrument Company, and the concrete battery vaults of the Potter-Winslow Company, all renowned for their superiority.

All of these manifold and widening activities, some tributary to industries that safeguard life and limb of the traveler, others to those that contribute to the safety of those who must approach and cross rights-of-way, led the company, by easy stages, to the manufacture of its own line of highway crossing signals, which have thoroughly proved their efficiency in operation.

Placing upon the market illuminated crossing signs of improved pattern and crossing alarm bells that may be depended on has resulted in swelling the line of goods dealt in to include a large variety of appliances and accessories for both highway crossing and block signal systems. Relays—both interlocking and track relays—annunciators and indicators, battery chutes and cable posts, bond wires and channel pins, drills and drilling machines, ground cones and lightning arresters, and all the thousand-and-one requisites for signal systems of all the various sorts—these it is the business of the Bryant Zinc Company to furnish.

Occupying, as it does, its entire building, the Bryant Zinc Company has every facility for the clean-cut, conscientious manufacture in which it prides itself. Ample floor-space makes it possible to carry a large stock in every line, which in turn, taken in connection with an earnest disposition to serve its patrons, insures prompt delivery.

Individual requirements in the matter of signal systems vary so widely as between one railway and another that the Bryant Zinc Company would not consider that it fulfilled its duty toward its clients if it regarded them simply as "customers." In the case of every installation it is the aim of the company that the preliminary planning be so well considered that absolutely the best type of signal and the most permanently efficient installation be provided.

Co-operation of this sort, freely offered by this company, and gladly received by signal engineers and engineers of maintenance of way, has its foundation in the fact that all manufacture is carried on under the supervision of a competent signal engineer. This co-operation, furthermore, marks all the difference between mere "selling" and *real service*. To the professions interested, the company offers its products in all confidence, and with assurance that the manner in which they are marketed will prove acceptable to the purchasing agent.

The factory and principal offices of the company are located in Chicago, with branch offices in New York, London and Montreal.

General Electric Company

The Gas Electric Motor Car in Branch Line Service

Signal Sub-Station of the New York, Westchester & Boston

THE advantages of clean, reliable and highly economical service which G-E railway equipment has given in main line and terminal operations for many years are now being rapidly extended to branch lines by the Gas Electric Motor Car. A complete train in itself, and MCB throughout, this car replaces steam operation with better service at one-third to one-half the cost.

In Signal Service, all kinds of G-E accessories, from special lamps to sub-station equipments complete, are rapidly becoming standard. The G-E Signal Accessory Department receives inquiries and renders assistance based on years of experience in signaling and a complete knowledge of the General Electric Company's products.

G-E Machine Shop motors and controllers cover every line of railroad machine shop practice; in fact "if *its* electrical" *it* is made by the General Electric Company.

Inquiries should be addressed to the nearest of our offices as follows:

G. E. Motor and Controller

General Electric Company

Largest Electrical Manufacturer in the World

General Office: Schenectady, N.Y.

Atlanta, Ga.
Baltimore, Md.
Birmingham, Ala.
Boise, Idaho
Boston, Mass.
Buffalo, N. Y.
Butte, Mont.
Charleston, W. Va.
Charlotte, N. C.
Chatanooga, Tenn.
Chicago, Ill.
Cincinnati, Ohio
Cleveland, Ohio
Columbus, Ohio
Davenport, Iowa
Dayton, Ohio
Denver, Colo.
Detroit, Mich.
(Office of Agent)
Erie, Pa.
Indianapolis, Ind.
Kansas City, Mo.
Keokuk, Iowa
Knoxville, Tenn.
Los Angeles, Cal.
Louisville, Ky.
Memphis, Tenn.
Milwaukee, Wis.
Minneapolis, Minn.
Nashville, Tenn.
New Haven, Conn.
New Orleans, La.
New York, N. Y.
Philadelphia, Pa.
Pittsburg, Pa.
Portland, Ore.
Providence, R. I.
Richmond, Va.
Rochester, N. Y.
Salt Lake City, Utah
San Francisco, Cal.
St. Louis, Mo.
Schenectady, N. Y.
Seattle, Wash.
Spokane, Wash.
Springfield, Mass.
Syracuse, N. Y.
Toledo, Ohio
Youngstown, Ohio

For Texas and Oklahoma business refer to General Electric Company of Texas—Dallas, El Paso, Houston and Oklahoma City. For Canadian business refer to Canadian General Electric Company, Lt'd, Toronto, Ont.

3882

Standard Underground Cable Company

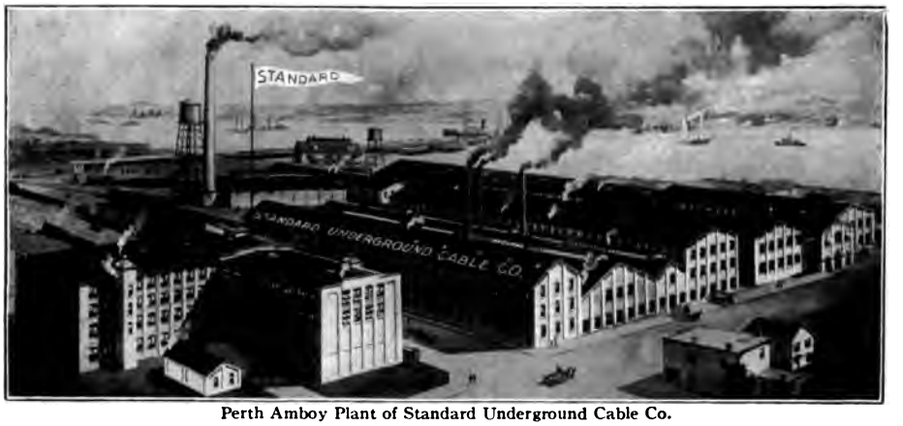
"Standard" Rubber Insulated Wire. The most valuable qualities in Rubber Insulated Wire (dependability in service and, hence, efficiency and real economy) have never been secured by rigid specifications and tests *alone*, nor in the long run except by purchasing from those manufacturers in whose experience, and in the dependability and true economy of whose product, a high degree of confidence can safely be placed.

We solicit your orders on the broad grounds that we meet these conditions in the fullest measure rather than that we offer our product at less than competing prices, or below our own costs. We aim to make a small profit on dependable products and you can not long afford to place your confidence or orders where this is not true.

C.C.C. and E.B.B. Colonial Copper Clad (C. C. C.) Wire stands among copper clad products for the very highest quality just as E. B. B. does among iron wire products.

We are exclusive manufacturers of Colonial Copper Clad Wire in accordance with the process developed by William Griffith of Pittsburgh, and patented (No. 580,344) by him April 6, 1897. This process and its products antedate by several years, both in the matter of invention and commercial development, any other method of manufacturing copper clad wire now used in the United States.

Beside being made by a patented and therefore exclusive process, Colonial Copper Clad Wire has desirable qualities which no other product of the kind possesses. For your service it insures maximum economy and durability at relatively minimum price.



Perth Amboy Plant of Standard Underground Cable Co.

The products manufactured by this company cover a complete line of electric wires, cables and accessories and may be briefly outlined as follows:

Wire Rods	Magnet Wire	Varnished Cloth Cable	Armored Cable
Bare Wire and Cable	Rubber Insulated Wire	(Varnished Cambric)	Cable Accessories
C. C. C. (Colonial Copper Clad) Wire	Weatherproof Wire	Paper Insulated Cable	Insulating Compounds
	Fibre Insulated Cable	Rubber Insulated Cable	Cable Installations

Detailed information, samples, estimates or prices cheerfully furnished in regard to the above. Our cable accessories are all of our own exclusive designs, resulting from many years of cable manufacture and installation.

The general offices of the company are in Pittsburgh, Pa., with branch offices in New York, Boston, Chicago, San Francisco, Philadelphia, St. Louis, and sub-offices in other cities. The factories are in Pittsburgh, Pa., Perth Amboy, N. J., and Oakland, Cal. Stocks are carried at the above factories and prompt shipment in any quantity will be made to any part of the country. Canadian business is handled by the Standard Underground Cable Co., of Canada, Ltd., general offices and works, Hamilton, Ont.

USL TRADE MARK
THE UNITED STATES LIGHT AND HEATING CO.

Storage Batteries

U-S-L Signal and Interlocking Batteries are in operation in every part of the country—all seasons of the year and under a great variety of service conditions. Regardless of what your particular conditions are, there is a **U-S-L Battery** that will meet your every requirement. We build them portable and stationary, and in many capacity sizes.

Exceptionally long life and high discharge capacity are features of **U-S-L Batteries** that recommend their use to every **Signal Engineer.** These qualities characterize every **U-S-L Installation** whether the duty is heavy or light, and regardless of temperature variations.

Only the purest materials go into **U-S-L Batteries.** Consequently the energy lost by internal discharge is negligible, resulting in longer battery life and sustained energy capacity. **U-S-L Battery Plates** are designed to expose the largest amount of surface consistent with plate strength to the action of the electrolyte, thereby securing the greatest possible capacity.

Complete Information on Request

The U. S. Light & Heating Co.

General Offices: 30 CHURCH ST., NEW YORK Factory: NIAGARA FALLS

Branch Offices and Service Stations:

NEW YORK BOSTON BUFFALO CLEVELAND DETROIT
CHICAGO ST. LOUIS SAN FRANCISCO

Potter-Winslow Company

Railway Supplies in Concrete

Battery
Vaults

Battery Chutes

Battery
Boxes

Telephone
Booths

Watchmen's Houses

Cable Houses
Oil Houses

Peoples Gas Building, Chicago

NorthWestern Construction Company

(SPACES 3 AND 4 COLISEUM)

Invite inspection of their

NorthWestern Highway Crossing Gates

GATES OPEN GATES CLOSED

N.-W. Connectors

are being extensively used in all branches of

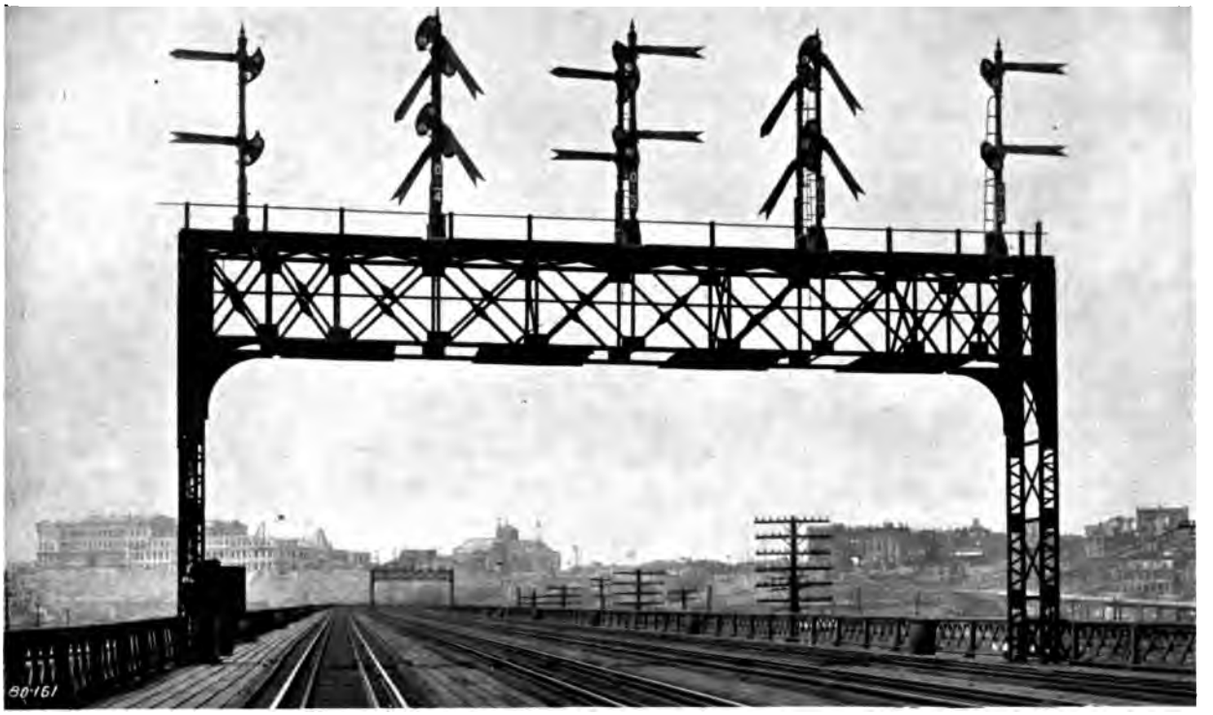
Railroad Work

We are also showing a complete line of
Electric Traction and Signal Accessories

NorthWestern Construction Company

50 Church Street, New York

The Kerite Insulated Wire & Cable Company



Signal Bridge on Viaduct East of Bergen Archways, Erie Railroad.

Signal Cabin "A" New York Terminal, Pennsylvania Railroad.

The Kerite Insulated Wire & Cable Company

SCARCELY one-third of the period of one hundred years mentioned in the foreword of this volume as witnessing the inception and development of railroad transportation is required to compass the development of the extensive electrical installations found on steam railroads today. For over half a century, practically the only electrical apparatus used by railroads was the telegraph. Now electricity enters as fully into steam railway activity as into any industry where it is not used as the principal form of power. For the telegraph and telephone service, electric lighting of cars and buildings, power for shops and for fuel and water stations, and especially for interlocking and automatic block signaling, electric current plays a vital part in railroad operation, and is rapidly extending to include the field of train propulsion.

No feature of electrical installations on steam railroads is of more importance to the safety and regularity of service than insulation. Safety, reliability and economy of operation are today greatly dependent upon the service rendered by the insulated wire and cable used.

The performance record of Kerite, covering half a century, is absolutely unequalled in the whole history of insulated wires and cables. The ability of this insulation to withstand the deteriorating influences met in railroad service, its known superiority under the most severe conditions and its remarkable durability have led to its occupying today a commanding position in railroad signaling work as well as in other service where the highest grade insulation is required.

The Kerite Insulated Wire & Cable Company manufactures all kinds of insulated wire and cable for railroad use, from small wire carrying light voltages to heavy cables for high tension circuits, including wire for car lighting, station lighting, shop power, telegraph, telephone and signal installations and for aerial, interior, underground and submarine work under any and all conditions of service.

The first cost of an insulated wire or cable where efficiency or permanency becomes a factor is, or should be, a consideration of minor importance and the fact that Kerite is so extensively used for railroad work shows conclusively that this is today thoroughly appreciated.

Kerite wire and cable made half a century ago is still in service, so that, although its first cost is higher than other insulations, its extraordinary life and efficiency make certain a remarkable ultimate saving, to say nothing of what amounts to insurance against trouble (either expensive, dangerous, or both) and maintenance charges (too often overlooked), which result when an inferior insulation is used.

The Company's works are located at Seymour, Connecticut, its executive office in the Hudson Terminal, 30 Church Street, New York, N. Y., and its western office in the People's Gas Building, Chicago, Illinois.

The Union Switch & Signal Co.

General Office and Works of The Union Switch & Signal Co. at Swissvale, Pa.

DEVELOPMENT

THE history of The Union Switch & Signal Company has been one of steady, healthy growth. The company first started in business in Pittsburgh, Pa., in a shop in Garrison Alley, in 1881. Here switches and frogs as well as signal apparatus were made. In the spring of 1887 the available space was outgrown and the plant was moved to Swissvale, where the property of the Swissvale Car Works was purchased. When, in 1900, it was again necessary to secure more space, the old shops were removed, and on the site were erected complete new ones, having a capacity three times greater than those which preceded them.

In 1907 a new power house, new foundry and new blacksmith shop were erected. In 1912 an addition to the office building was built, giving a total floor space of 550,254 square feet. Of this 509,784 square feet are in the shops and 40,470 square feet in the office.

THE following table shows in greater detail the space added from time to time to the shops and office:

Old shop, 1899	85,125 sq. ft.
New shop, 1900	308,520 sq. ft.
New galleries, 1905	16,020 sq. ft.
New buildings, 1906	28,164 sq. ft.
New buildings, 1907	157,080 sq. ft.
Total, 1907	509,784 sq. ft.

OFFICE

1899	3,000 sq. ft.	1907	24,240 sq. ft.
1900	20,400 sq. ft.	1912	40,470 sq. ft.

The area of the land owned by the company is 52 acres, and on this there are about three miles of railroad track served by one 40-ton locomotive. All weighing of cars is done on the company's own track scales.

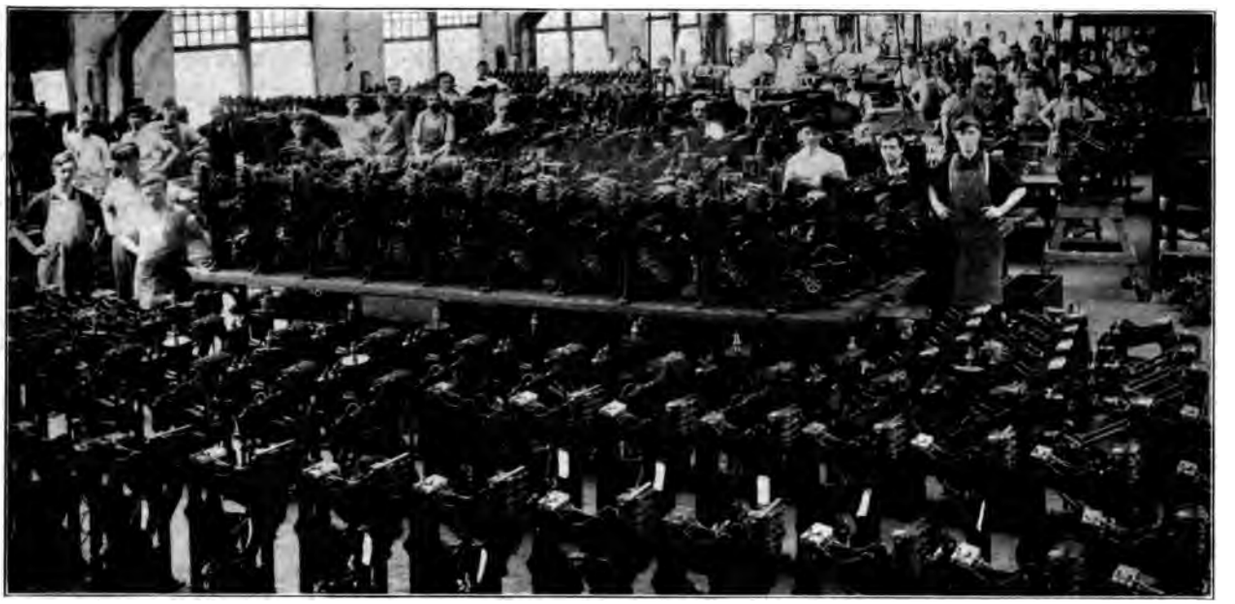
All buildings are unusually well arranged, with a view not only to ample floor space but to light and ventilation as well. Complete fire protection is afforded by a system of automatic sprinklers, the installation of which in the old buildings alone cost $40,000.00.

TRADE MARK

TRADE MARK

"UNION MATERIAL FITS"

The Union Switch & Signal Co.



A Part of the Electric Semaphore Signal Department. Signal Mechanisms Ready for Test

THE NEW BUILDINGS

THE new buildings added in 1907 were the power house, foundry and blacksmith shop. These were designed by the company's engineers. Great care was taken to provide for the economical handling of material into, through and out of the plant, including the grouping of tools, arrangement of tracks, and motors. Special attention was paid to lighting and ventilation, and shower baths and clothes lockers were provided for the men.

The buildings are fireproof throughout, built entirely of steel, brick and concrete. Wood was used only for window frames and doors.

The power house floor space is 19,200 square feet, divided equally between main floor and basement. The equipment includes three 340 k. w., a. c. generators direct connected to three 500 h. p. gas engines, two 75 k. w., a. c. generators direct connected to two 125 h. p. gas engines.

THERE are also one 75 k. w. motor generator exciter, one 25 k. w. motor generator set, one air compressor for starting gas engines, one 15 ton a. c. electric traveling crane and one 12-panel switchboard. Gravity lubrication and filtration are used throughout. The gas engine exhaust heats the feedwater for the boilers and, in winter, the power house. Provision is made for the addition of three 500 h. p. engine and generator units, which will give the plant a total capacity of 3,250 electrical horse-power. Piping and wiring are in the basement, open for inspection. To facilitate handling machinery a track enters the power house. The engines are designed to use natural or producer gas. A gas plant will be built when the supply of the natural product becomes scarce or too high in price. The water for cooling the engine jackets is circulated by pumping to a 450,000-gallon tank.

TRADE MARK

TRADE MARK

"UNION MATERIAL FITS"

The Union Switch & Signal Co.

A Corner of the Motor Department

FOUNDRY AND BLACKSMITH SHOP

THE foundry covers 91,800 square feet. The equipment includes the following: one each 96-inch cupola, 72-inch cupola, positive blower of 48 cubic feet capacity, No. 10 blower; two gas and three crucible brass furnaces, blower for brass furnaces, one electric separator, eight molding machines, 10 tumbling barrels, one 60-foot five-ton electric crane, one 30-foot 10-ton electric traveling crane, two sand mixers, one paint tank, gas core ovens, 10 emery wheels, one exhaust fan and 1,200 feet overhead trolley system of 1,000 pounds capacity, used in the low bay to handle ladles. The five-ton crane is used in the high bay.

About 350 electrical horse-power is consumed in the foundry. There is a saw-tooth roof with north exposure, large wall windows, skylights and glass in the roof monitor. The total area of glass is 36,519 square feet.

THE blacksmith shop consists of a main building 120 feet by 336 feet and a storeroom for iron 60 feet by 96 feet, a total of 46,080 square feet. It contains one 125-h. p. vertical steam boiler, heated by waste gases from the furnaces or by independent firing. It supplies power to the steam hammers. There are eight down-draft forges; nine drop hammers, two 3,000 pounds, two 1,600 pounds, two 1,500 pounds, and three 800 pounds; six steam hammers; one punch and shear; eight trimming presses; three shears; two bulldozers; nine forging machines; one forging roll; one 80-inch exhaust fan; three blowers; two cushion hammers; 24 gas down-draft heating furnaces.

In the tool room there are three shapers, one planer, universal milling machine, emery wheel and drill press. About 250 electrical horse-power is consumed in this shop.

TRADE MARK

TRADE MARK

"UNION MATERIAL FITS"

THE HALL ELECTRIC INTERLOCKING

embodies many important improvements that will instantly appeal to the discerning signal engineer. These include:

Direct current operation with alternating current indication, which provides distinctive safety features.

Unit construction, permitting the removal or addition of one or more levers without interference with the others.

Designed to provide the maximum degree of protection against wire crosses.

Time required to operate switch and receive return indication, 2¼ to 2½ seconds.

Simple in design and rugged in construction.

Hall Switch & Signal Company

50 Church Street

New York

Chicago

Works: Garwood, N. J.

2002-M

THE HALL PRACTICE IS

To offer the best that engineering skill and modern manufacturing facilities can produce—

never to be satisfied with past achievements and to constantly strive to increase the efficiency and reliability of Hall Apparatus.

To offer a service after their work is installed that will demonstrate their confidence in their product, their work and themselves.

The history of the development of track protection will show that a large share of that progress has been due to Hall initiative.

The Hall Style "K" Signal has proven itself to be incomparably trustworthy and reliable, and stands today the embodiment of the Hall Practice.

A booklet describing this signal will be sent upon request.

Hall Switch & Signal Company

50 Church Street

New York

Chicago

Works: Garwood, N. J.

2008-M

G. R. S. Electric Interlocking Using Dynamic Indication

AN INTERLOCKING system is an arrangement of switch and signal functions operated from a central point by the manipulation of the levers of an interlocking machine, the levers being so interlocked that their movements must succeed each other in a predetermined order.

Power interlocking is an interlocking in which power other than manual is used to directly operate the functions.

The essential and vital requirement of all power interlocking is that the completion of the movement of a lever must be dependent upon the completion of the operation of its controlled function so that a correspondence of position is insured between lever and function.

The merit of a given system of power interlocking as a safety device is determined by the reliability of the method of meeting this most essential and vital requirement.

Electric interlocking is an interlocking in which electric power is used to directly operate the functions.

In electric interlocking the stroke of the lever is divided into a preliminary and final movement. The preliminary movement locks all levers whose movement would conflict with the final position of the lever, and operates the function. The final movement which releases such of the levers as do not conflict with its final position should be made only after an indication has been received, indicating the completion of the operation of the function.

In the G. R. S. Electric Interlocking the distinguishing feature is dynamic indication.

DYNAMIC INDICATION means an indication caused by current generated by the momentum of a motor which operates the function. This current can be generated only when the motor is free from load. The motor is free from load only after it has operated the function, consequently, until the movement of the function has been completed, it is IMPOSSIBLE to obtain an indication.

Dynamic indication is therefore correct in principle, and in practice it has been found to operate unfailingly according to principle, thereby making possible a thoroughly reliable power interlocking system.

The G. R. S. Electric Interlocking System using dynamic indication is not only thoroughly reliable, but it possesses marked simplicity with a low cost both for operation and maintenance. These advantages have become thoroughly appreciated, with the result that it is employed both for large and for small installations.

The most extensive installation is on the New York Central Electric Zone, which includes the Grand Central Terminal in New York City. This terminal comprises 67 station tracks and in it are installed two G. R. S. Electric Interlocking machines, one with a capacity of 360 and the other 400 levers, either of which is larger than any other interlocking machine of any type in the world.

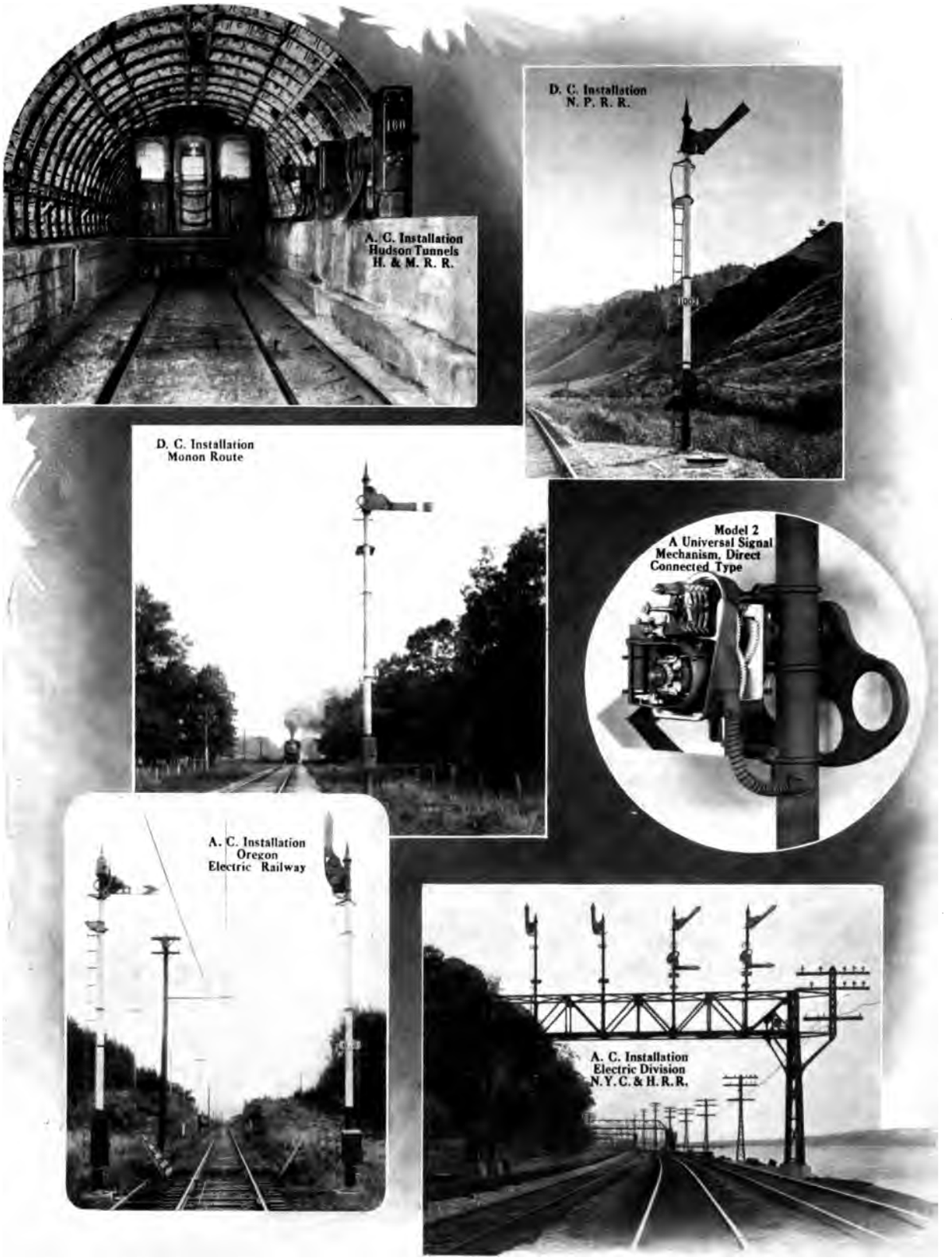
Eighty per cent of all power interlocking now installed is G. R. S. Electric Dynamic Indication. On a basis that one interlocking lever in use for one year equals one

General Railway Signal Company

Grand Central Terminal, New York City

G. R. S. Electric Interlocking Machines, Grand Central Terminal, New York City

General Railway Signal Company



lever-year, the G. R. S. System now shows a record of 110,000 lever-years.

The reliability and general merit of the G. R. S. Electric Interlocking System is conclusively proven, not only by its selection for the largest power interlocking in the world, but also by its well-nigh universal selection for all power interlocking.

G. R. S. Automatic Block Signals

AUTOMATIC BLOCK SIGNALING with continuous track circuits is the recognized standard of American Railways. The track circuits were operated and the signals either operated or controlled by direct current until the need for signals on electric railways made it necessary to use alternating current.

Direct current is furnished from batteries. Alternating current is furnished from a central power station and it is used for the track circuits, signals and for lighting them. It shows a marked economy in comparison with direct current. By its use the wrong operation of signals due to foreign current is prevented. Its use is necessary in electric railway signaling. Due to its many advantages the trend of automatic block signaling is now toward a more extensive use of alternating current on steam railways.

The largest electric signal system in the world is the G. R. S. Automatic Block and Electric Interlocking on the Electric Division of the N. Y. C. & H. R. R. R. at New York City. This was the first alternating current signal system installed on a road operating heavy traffic by electric power. This installation includes the Grand Central Terminal with a total of 67 tracks, extends to North White Plains, 24 miles, and is being completed to Croton, 34 miles.

The Absolute Permissive Block System was introduced by the G. R. S. Company to meet a strong demand for an adequate system for the large mileage of single track railways. It at once met with marked favor because it was the first automatic block system based on the fundamental principles of correct, single track train operation. It provides for train movements from one passing track to the next under complete signal protection. It permits following train movements as in double track operation. It insures maximum safety and facility at a lower cost than is possible with other systems.

High efficiency of the G. R. S. Signal System is shown by the record of the G. R. S. Automatic Block Signals with automatic stops in the tunnels of the Hudson & Manhattan Railway between New York and New Jersey. This signal system shows but one defective operation to every one million movements.

The G. R. S. Model 2-A Signal is the type of semaphore signal used either in automatic block or interlocking. It is of the direct connected or top mast type (can also be used at the base of mast). It has no slot or dash pot, operates in either two or three positions, upper or lower quadrant and by either A. C. or D. C. It is simple and rugged in construction and is reliable under all conditions of service.

Federal Signal Company

New York Office
103 PARK AVENUE

Main Office and Works, Albany, N. Y.

Chicago Office
1129 MONADNOCK BLOCK

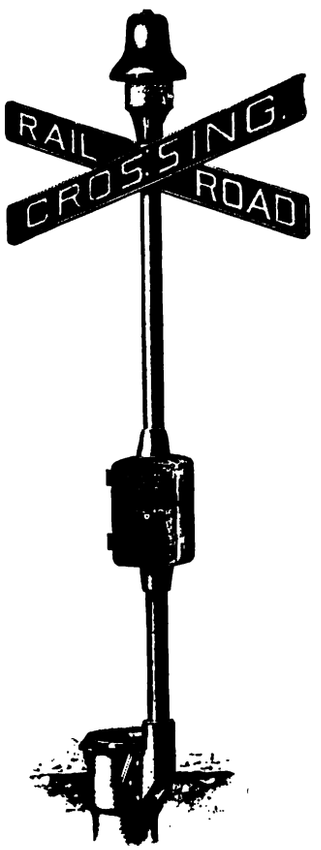
Railway
Signal
Engineers
and
Contractors

Interlocking
Material
and
Installation
Both
Mechanical
and Power

Electric Interlocking Machine, Riverside, B. & A. R. R.
100 Levers

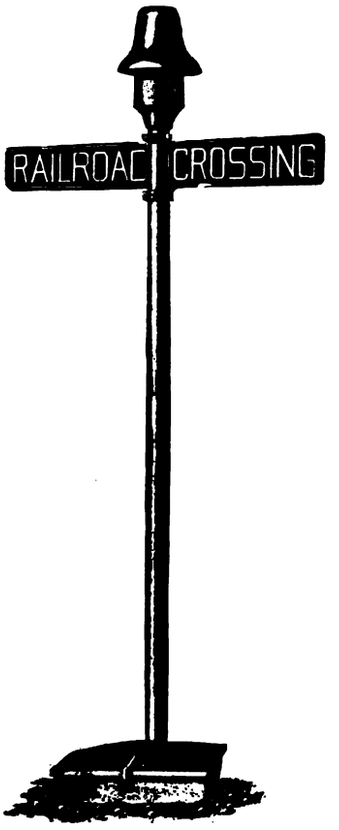
The Railroad Supply Company

Standard Highway Crossing Signals with Locomotive Type Bells



No. 2028

No. 2030



No. 2032

These signals are furnished with or without illuminated signs, and when used with our standard equipment of Relays, Insulated Rail Joints, Battery Chutes, Lightning Arresters, Channel Pins and Bond Wires are absolutely dependable under all conditions.

MANUFACTURED AND SOLD EXCLUSIVELY BY

The Railroad Supply Company

CHICAGO

The Railroad Supply Company

Wolhaupter Shoulder Flanged Tie Plates

PATENTED

Will hold track to gauge and are stronger, lighter and will resist wear longer for a given size than any other design of Tie Plate made.

MANUFACTURED AND SOLD EXCLUSIVELY BY

The Railroad Supply Company

CHICAGO

Rossi-Titanium

AMONG the railway appliances which protect human life should be included all steel which has had the benefit of titanium treatment.

Impurities are found in practically all untreated metals and none more so than in various kinds of steel.

Tantalizing as it may seem there is no way to prevent the use of impure or imperfect metal in hundreds of places where suffering and death are the penalties paid. Purposely or otherwise poor materials continue to be used where good judgment if exercised would, almost of necessity, eliminate them.

Thoroughly in accord with scientific means and methods, all metals treated with titanium develop highest possible qualities.

Since the inception of electrically refined alloys it has been possible to obviate many of the difficulties previously experienced in the manufacture of durable equipment.

Probably no greater revolution has ever occurred in the manufacture of steel than has taken place through the use of the now well-known titanium alloy made by the power of the electric current brought from the wonderful Niagara Falls.

To prove the strength of any metal it is necessary to first obtain a means or a method which eliminates occluded gases, impurities of various kinds, and at the same time preserves the good qualities inherent in the metal itself. This improvement has now been accomplished so definitely that one has only to refer to statistics to find that the use of titanium alloy has become a standard in a majority of the steel foundries of this country to such an extent that nearly a million tons of titanium-treated steels have been made in America during the past three years.

The marvelous strength of the alloy itself is evidenced in the extremely small percentage utilized in a given quantity of metal. In small crucibles, holding 100 pounds of steel, titanium alloy is only used as a physician might use a powerful remedy, viz., by the spoonful. In fact titanium is a strong medicine in all grades of steel,

forcing out the causes of weakness and leaving in their stead the strong and reliable elements of strength and durability.

Probably no other material ever used in steel could be compared to this in its purifying and strengthening effect upon molten iron and steel. Recent experiments show that other metals may be improved by adding titanium to the principal element to be smelted, for instance copper, and using this alloy to purify a bath of molten copper. Other combinations are equally available and must eventually make titanium the master alloy not only in ferrous materials, but in many of the non-ferrous as well.

The General Sales Department of the Titanium Alloy Manufacturing Company is located at Niagara Falls, N. Y.

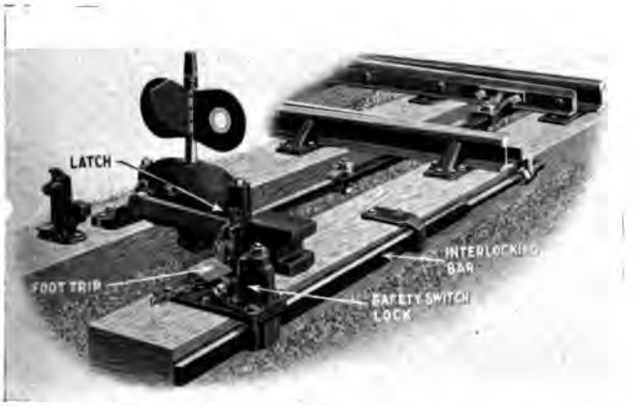
The Anderson Safety Switch Lock guarantees safety and insures proper closing of *Main Line Switches*

THIS device combines every element that is necessary for absolute safety and at the same time is simple and easy to operate.

The interlock insures the proper closing of the switch before the stand can be padlocked.

The accompanying illustrations show the Anderson Safety switch lock in combination with the Economy switch stand.

This device can be used with most any other make parallel throw type switch stand.



Installation of Anderson Safety Switch Lock with Economy Switch Stand. Switch is properly closed and interlocked with padlock applied to foot latch.

Installation of Anderson Safety Switch Lock. Obstruction between Switch point and main stock rail prevents Switch from closing properly. It does not interlock and cannot be padlocked.

Any obstruction between switch point and stock rail prevents switch from interlocking—unless interlocked, the Padlock cannot be applied to switch-stand.

This eliminates danger caused by permitting a sharp flange to split switch and cause accident.

The switch cannot be opened under traffic even if the switch stand be destroyed by accident, or become disconnected from the switch. The switch point being interlocked, the safety lock will prevent it from opening.

In closing the switch, if it becomes disconnected from the switch stand, the padlock cannot be applied.

One lever operates the switch, the interlock and target in one movement.

We also make an interlocking switch stand known as the skeleton type with similar locking features.

Both types have practically the same points of safety regardless of the type of stand. They are the most economical, safe and simple method for interlocking **main** line switches.

The Anderson Safety switch lock and the Interlocking switch stand are being tested by a number of railroads with great success.

We cordially invite tests of the above device. Complete information sent on request. Manufactured exclusively by The American Valve and Meter Company, Cincinnati, Ohio.

Poage Water Columns embody all the essential features with the qualifications most desirable

THE qualifications most desirable in a water column for locomotive water service are low frictional loss of head, a quick shut-off without hammer, and delivery without waste, into high or low tender and without requiring accurate spotting of locomotive.

Experiments conducted by University of Illinois on the principal types of water columns, showed for the Poage style "H" column, a remarkable record for low frictional loss of head due to unobstructed water way, insuring large flow and quick delivery. The Poage style "H" also proved itself to be the only column on the market with a mechanism for promptly shutting off large flows without water hammer.

The time required for closure can be varied to prevent hammer, under any pressure conditions, by simply regulating the governor of the automatic closing device, provided in this column.

These tests showed that the first 85% of valve closure can be made as quickly as possible, the water hammer occurring on the last 15% of closure.

The Fenner Drop Spout furnished with Poage water columns, has many decided advantages over all other types of flexible spouts.

The ease of operation, simplicity of construction, and the wonderful flexibility makes this spout extremely popular on the many railroads using it.

The Fenner Drop Spout has five-foot range of adjustment at discharge nozzle. It can be set to clear coal pile on highest tenders and deliver water to the lowest without waste.

The spout has a three-foot lateral movement which, with the out and in adjustment, renders accurate spotting of locomotive unnecessary, saving considerable time in taking water. This feature also prevents column from being knocked over due to shifting of locomotive. This means an enormous saving in maintenance, as columns are frequently knocked down due to this cause.

The open telescopic joint cannot freeze. There are no packings or working parts in the joint.

The spout is supported entirely from overhead. There are no side bars to restrict movement of spout in any direction. Spout swings back parallel to track, by gravity; no springs or locking levers required.

Manufactured exclusively by The American Valve & Meter Company, Cincinnati, Ohio.

High Tender—Man Hole 12 Feet Over Rail

Low Tender—Man Hole 7 Feet Over Rail

Taking Water from Poage Style "H" Automatic Water Column equipped with Fenner Drop Spout

Shoulder Tie Plates

Rolled from Open Hearth Steel Billets

Longitudinal and Transverse Flanges

STYLE A STYLE B STYLE O STYLE R

No more satisfactory plates can be placed under rails than the types represented above.

(Our Catalog describes 20 different styles of plates)

Manhattan Compromise Rail Joints

Cast Steel

Base supporting, centrally reinforced joint having an approximate equal distribution of metal for each rail, and stronger at the center than any other known type of construction.

THE ELYRIA IRON & STEEL CO.

ELYRIA, OHIO

Represented by The Hart Steel Co., Elyria, Ohio

SALES AGENCIES

New York: J. H. ALLEN, United States Express Building
Chicago: G. S. WOOD, Great Northern Building
Richmond, Va.: J. B. KIRTLEY, Mutual Building
Atlanta: J. M. VAN HARLINGEN, Candler Building
San Francisco: WESTERN RY. & MILL SUPPLY CO., Monadnock Building
(For Rail Joints) St. Louis: W. H. DAYTON, Security Building

"A Man is Known by the Company he Keeps, a Workman by the Tools he Uses"

HUBBARD

TRADE-MARK

ON YOUR TRACK TOOLS ASSURES YOU THEY ARE THE BEST THAT MONEY CAN BUY

HUBBARD

Track Shovels Hold their Edge in Sand, Gravel and Rock.

HUBBARD

Track Chisels Keep their Temper on Bessemer, Open Hearth and Chrome Nickle Rails.

HUBBARD

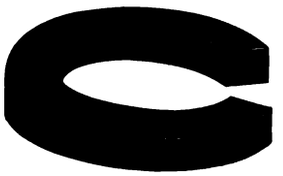
"R.M.A." Claw Bars have a Big "Pull" with all who use them.

Write for Catalog

HUBBARD & CO.

PITTSBURGH, PA.

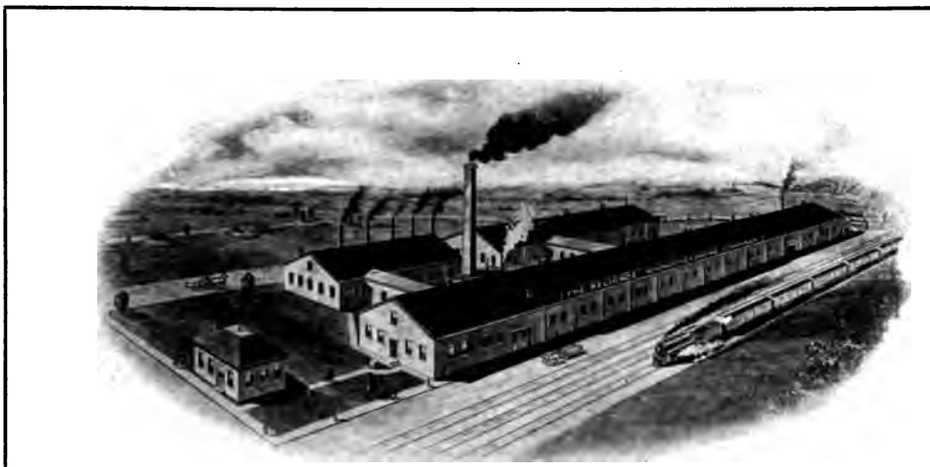
Reliance Nut Locks



Type B

Made for every size bolt and from any section of steel of special analysis, carefully selected for the purpose, which is subjected to various severe tests before and during every operation of manufacture into nut locks.

Type D



Type C

We respectfully solicit your specifications for quotations, and will always be glad to furnish "no-charge" samples for test purposes. Complete catalogues mailed upon request

Type E

The Reliance Manufacturing Company

Factory and Home Office: MASSILLON, OHIO

NEW YORK	DETROIT	CHICAGO	SAN FRANCISCO
253 Broadway	121 Wayne Street	180 N. Dearborn Street	171 Second Street

The P. & M. Company

RAILWAY EXCHANGE, CHICAGO

THE advent of the P. & M. boltless, self-maintaining, self-operative, malleable rail anti-creeper renewed the dying faith of the railroad man in the efficiency of the **anti-creeper.** The illustrations of the installations of the P. & M. 98 per cent efficiency **anti-creeper** show the result of this returning confidence.

P. & M. Rail Anti-Creepers Anchoring Approach to Pittsburgh & Lake Erie Railroad Bridge, McKeesport, Pa.

P. & M. Rail Anti-Creepers on the Erie Railroad on Viaduct Approaching Bergen Archways, Jersey City, N. J.

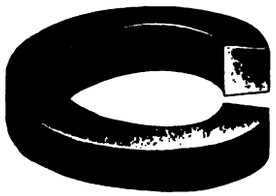
P. & M. Rail Anti-Creepers on the Chicago & North-Western Railway near Deering, Illinois

P. & M. Rail Anti-Creepers on the Michigan Central Railroad in the Detroit River Tunnel

P. & M. Rail Anti-Creepers on the Northern Pacific Railway, between Stampede, Wash., and Weston, Wash.

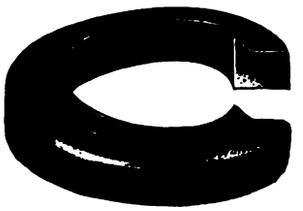
P. & M. Rail Anti-Creepers on Southern Pacific Company through Suisun Swamp, near Suisun, California

The National Lock Washer Co.



Plain, ¼ in. x ¼ in.

Nut Locks



National Rib

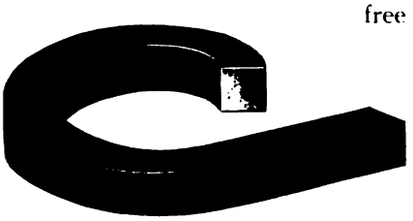
Material NATIONAL NUT LOCKS are made from that quality of steel which twenty-seven years' experience has taught us is best suited for the manufacture of NUT LOCKS. All our steel is annealed in our Annealing Plant and allowed to assume its proper molecular structure before making it into NUT LOCKS. This eliminates any strains in the metal.

Plain, Extra Wide

Method of Manufacture All our mechanical operations are upon new and improved machinery. Our heat treatment to obtain proper spring temper is entirely automatic and is checked by Pyrometers, thus assuring absolute uniformity of product. This process is patented and controlled by us.

Parallel, ⅜ in. x ¼ in.

Tests Throughout the whole process of manufacture we make continual running tests of the NUT LOCKS to determine proper fiber, toughness and resiliency. These tests enable us to offer NUT LOCKS which we can guarantee free from breakage and loss of resiliency.



Tail, ¼ in. x ¼ in.

Established in 1886, we are now the largest manufacturers of NUT LOCKS in the world.

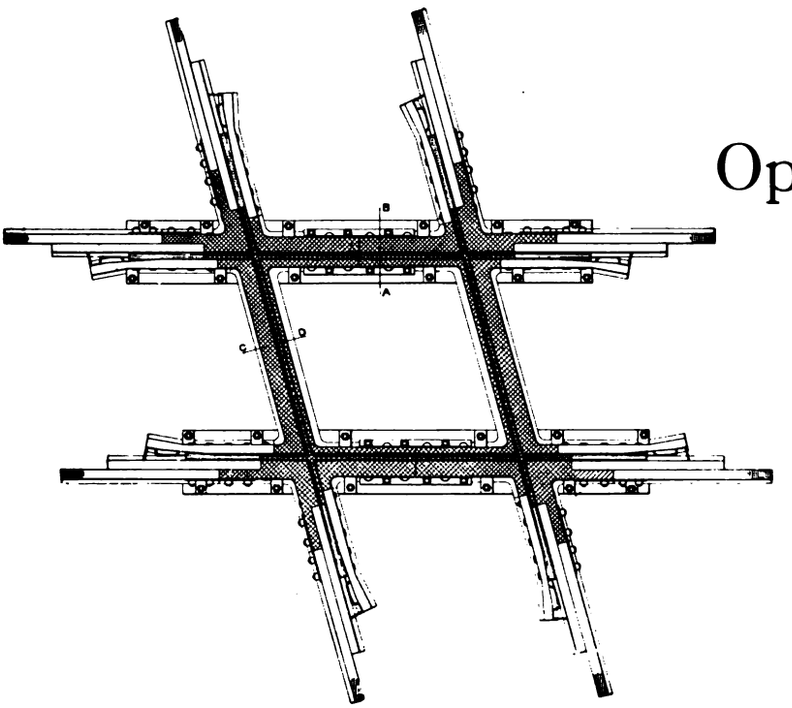
Parallel, ⅜ in. x ⅜ in.

The National Lock Washer Co.

Chicago, Ill. Newark, N. J.

Morden Frog and Crossing Works

CHICAGO



SOLID MANGANESE CROSSING
With Built-up Arms and Extended Easing Rails

Bessemer Open Hearth and Manganese

Frogs Crossings and Switches

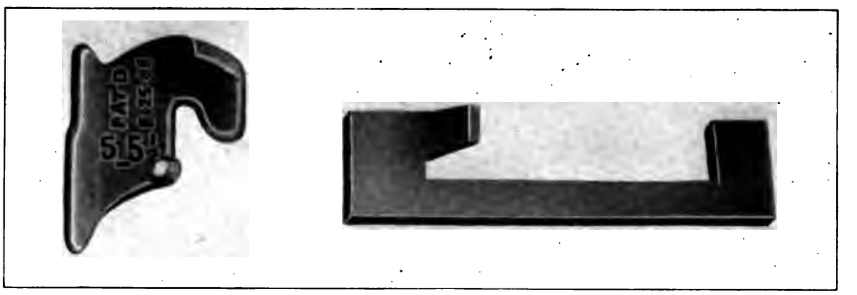
The MORDEN ADJUSTABLE CLAMP

Possesses great strength.
Has few parts.
Is easily adjusted *and*
Can be placed in position without disturbing the Guard Rail.

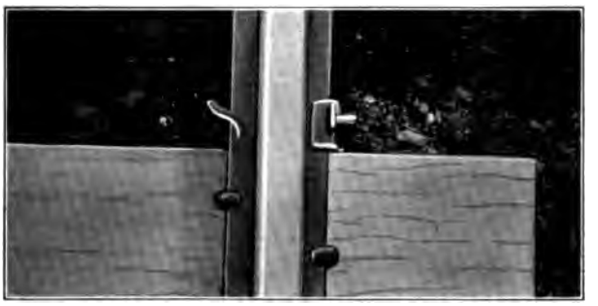
THE "MORDEN" GUARD RAIL CLAMP

M. W. Supply Company

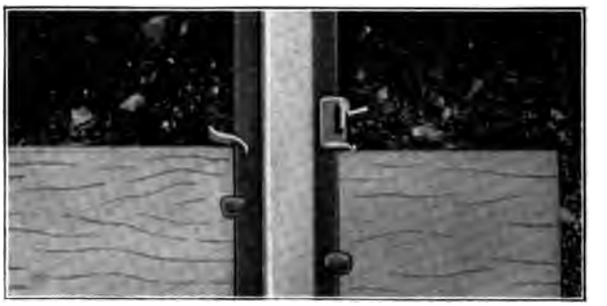
The Vaughan Automatic Rail Anchor



1. Composed of two parts; a powerful Spring Steel Yoke and a Malleable Iron Shoe.



2. Showing Vaughan Rail Anchor after application to rail. Note that it does not have its final grip on the rail in this position. Spring should be driven to diagonal position shown in cut to the right.



3. Showing Vaughan Rail Anchor with final positive grip on rail base. Should spring not be *driven* to this position; it will take it in any event before rail has crept one inch.

The Vaughan Rail Anchor is an extremely simple device and one that may be applied to the rail in a few seconds. Once applied, it takes a positive grip on the rail base and will not slip under any condition of service. The two parts interlock and are held rigidly together on the rail base by the torsional reaction of the spring steel yoke. The device is guaranteed to hold the rail from creeping, to remain tight and operative at all times, and as to quality of material. Samples will be furnished on application or will ship subject to approval.

The number of the Vaughan Rail Anchors required must be determined by local conditions, but good practice would never be less than one rail anchor on the free end of all new or respaced joint ties. This will keep them square with the rail and double resistance to creeping. If roadbed is soft or track creeps badly, one anchor should be placed on each end of as many intermediate ties as may be necessary. The resistance to creeping of each pair of anchors is limited to the force required to shove the tie ahead through the ballast.

The Vaughan Splice Straightener and Rail Bender, and the Vaughan Universal Foot Guard are also products of this company. The General Office is located in the Real Estate Trust Building, at Philadelphia, Pa.

VAUGHAN GUARD RAIL CLAMP

HIGH EFFICIENCY—LOW COST

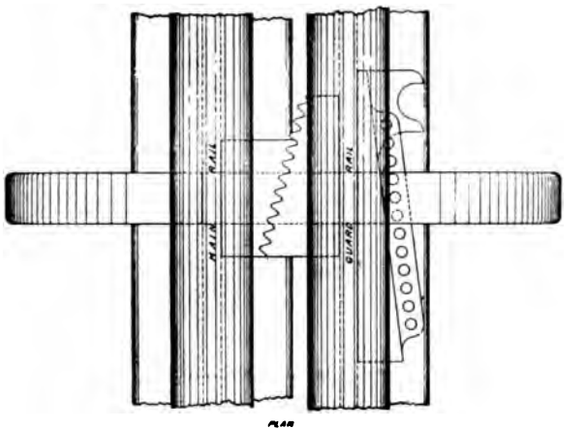


Fig. 1.

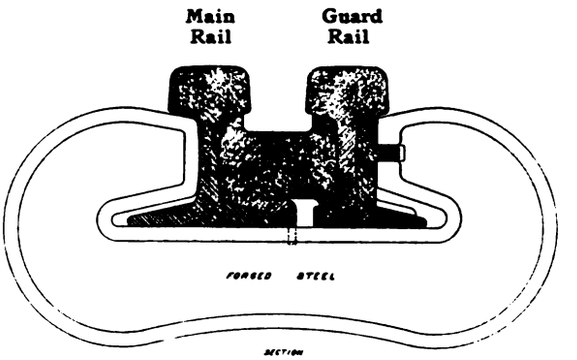


Fig. 2.

The VAUGHAN CLAMP has an extra wide Drop Forged steel yoke, with best quality Malleable Iron Wedge and Adjustable Fillers, and is designed to meet the demand for a hard service clamp at moderate cost.

This is a very strong and practical guard rail clamp of the highest efficiency. Note that it bears on the web of both rails, high up under the head, and that it can be placed anywhere between the ties and the key secured with cotter pin in the usual manner, or, if placed against the side of a tie, the key can be doubly secured by spiking. The use of either or both methods of fastening is optional.

Filler blocks are adjustable for any desired throat. Depending stay lugs on short filler, improved by addition of crushing edge, to prevent breakage. No holes required in either main or guard rail. Easily applied and guaranteed to give satisfaction under heaviest traffic.

When ordering always specify rail section.

AMERICAN GUARD RAIL FASTENER CO.

Real Estate Trust Building, Philadelphia, Pa.

SPECIALISTS IN GUARD RAIL FASTENINGS SINCE 1896

VAUGHAN GUARD RAIL CLAMPS - ANCHOR GUARD RAIL CLAMPS - TIE PLATE GUARD RAIL FASTENERS
PRESSED STEEL AND MALLEABLE IRON RAIL BRACES

"Vaughan" Anti-Rail Creepers

THE far-reaching effects of the damage created by creeping rails are hardly estimable. Reports of derailments, broken joints, fractured rail, failure of switches to work, or of movable parts about an interlocking layout, are incomplete unless part of the responsibility is charged to creeping rails.

Installations of crossings, switches, frogs and other special work, are made with a view of resisting the forces of traffic passing over them, and to facilitate a rapid manipulation of the swift-moving loads, but no consideration is given to the stresses and strains generated in the track itself, which presses on all sides of these layouts.

CAUSE OF RAIL CREEPAGE

Rails creep because of the changes in atmospheric temperature and the wave motion of the track produced by the tremendous forces of traffic upon resilient roadbed. All rails creep more or less. The creepage is greatest on a down grade and in the direction of traffic. It is less on stone ballasted roads than on any other type of ballast. Under high speed traffic and where trains are frequently brought to sudden stop it is very pronounced.

The problem confronting maintenance engineers is to provide means of reaction to retard this rail creepage. Manual labor can hardly be expected to do more than repair the damage, by respacing and tamping of ties. At this particular time the scarcity of labor makes it most desirable to provide a preventative for creeping rails.

ECONOMY IN USING RAIL ANCHORS

As a labor-saving device, the efficient rail anchor has few peers. Comparative costs per mile of maintenance have been computed with and without anti-rail creepers and evidence shown by the accounting departments eliminated the question of doubt in the investigators' minds as to the advantage of anti-rail creepers, without considering their action as a preventative—forestalling accidents.

The futility of tamping the joint ties, of strapping the ties to the rail by means of old angle bars bolted to rail and spiked to ties has been proven. The results of the reaction of the track under moving loads has been to "churn" the ballast. Rails not only creep forward under fast and heavy traffic, but rebound slightly after the trains have passed, which disqualifies any device permitting of stresses being applied in opposite directions upon the ties.

WHAT CONSTITUTES AN EFFECTIVE ANTI-RAIL CREEPER

To get results the anti-creeping device must grip the rail base securely and have an abuttment in contact with the tie but permitting of the rebound of the rail without dragging the tie.

An effective rail anchor must take a secure grip upon the rail base on its initial application. This grip must tighten automatically as the rail tends to creep forward. To accomplish these results the bearing of the abutting surface against the ties must occur at the extreme edge of the rail, thus providing for the maximum slewing of the yoke, a feature most prominent in the Vaughan Automatic Rail Anchor. It must resist vibration, require no attention after application or become loose when ballast freezes to rail base. The Vaughan Rail Anchor, having a yoke made of "high tension spring steel," grips firmly enough to successfully resist all these forces, as has been proven by five years' effective service on a number of large systems throughout the country. It does not come apart when frozen in the ballast nor depend upon rust to hold it on the rail. It does not slide on rail base because of its side bearing and spring steel yoke and can be applied in less than half a minute.

BEST RESULTS OBTAINED

Results are obtained by applying Vaughan Anchors in quantities of four to the rail, under ordinary conditions, and six to the rail when track is under severe stresses. They are usually applied on stretches of track for distance of a mile or more, on the approaches to bridges, crossings, switches, interlocking plants, etc.

Millions of Vaughan Rail Anchors are doing effective service in track to-day.

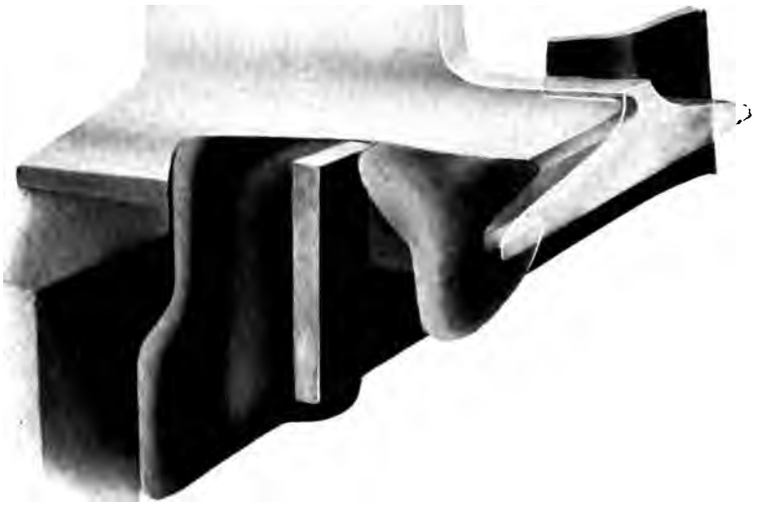
They are manufactured and sold by the Q & C Company, 90 West Street, New York City, and Peoples Gas Building, Chicago, Ill.

The Q & C Company

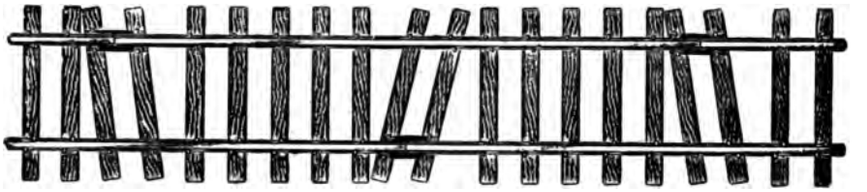
NEW YORK OFFICES: 90 WEST STREET
CHICAGO OFFICES: PEOPLES GAS BLDG.

Application

Tightening



"Vaughan" Automatic Rail Anchor



Effect of Creeping Rail

Illustrated Description of the "Vaughan" Automatic Rail Anchor

Q & C "Bonzano" Rail Joints

THE ever-increasing load of the rolling stock creates a demand for a more substantial roadway. Rail sections have been increased in weight and height to meet this demand. To advocate a continuation in the use of angle bars is to perpetuate the joint as the weakest point in track.

ANGLE BARS

The expense of maintaining the angle splice is greater than any other type. It bends under heavy traffic, sustaining a permanent set, and injures the rail ends by maintaining a low spot at this particular point in track. It has been estimated that the cost of maintaining a weak joint of this type, for the life of the adjacent rails, is equivalent to the cost of a new rail.

To devote an undue amount of time and labor on joint tie tamping, when there is a preventative, is inexcusable. Spacing ties when the steel is laid has been acknowledged by all good maintenance engineers as the best way of prolonging the life of rails, otherwise the new track is apt to assume the same kinks or contours as the old roadbed.

WHAT CONSTITUTES A PERFECT RAIL JOINT

For a perfect joint, and a smooth-riding track, the splicing must be such as to make the joint as strong and as stiff as the solid rail, and also as elastic, so that it will return to position after the inevitable deflections caused by the loads have been relieved.

The Bonzano Rail Joint fills the requirements as stated above and compels the spacing of ties, an argument in its favor rather than against it.

SPLICE BAR DESIGN

It is impossible in the limited fishing space of a rail to design an angle bar whose vertical rigidity is great enough to withstand the percentage of load it is compelled to carry, without taking a permanent set. By using Bonzano Joints, a continuous girder depth is maintained, due to the depending flange, which compensates for the rail head depth. The law governing beam designs, "the strength varies directly as the breadth, and directly as the square of the depth," is applicable to the design of the Bonzano Patented Joint. This splice bar transmits the lines of force generated by the wave motion from one rail to the other, by reason of its uniform cross-sectional area throughout, thus being the only suspended joint that has this qualification. This advantage is obtained by a novel method in the process of manufacture, which is herewith briefly described.

PROCESS OF MANUFACTURE

The bar is rolled to the section as shown on the end, or that portion resting upon the ties, then it is cut to the required lengths, punched and notched and reheated. After the desired temperature is reached, the depending flange with side gussets is pressed on the bar, which is then allowed to cool slowly. Reheating the bar relieves all the strains and stresses possibly generated in the rolling, punching and notching and may be considered as an annealing, a condition not met with in the production of any other suspended joint. In addition, the flange resting upon the ties permits of punching both slots and notches for spikes, which is appreciated by those using this type of splice.

The Bonzano Rail Joint is rolled at the mills of the Pennsylvania Steel Company, where the famous Mayari Ore enters into the manufacture of the Open Hearth Steel, the superiority of which is unquestionable.

At the plant of the Lackawanna Steel Company, where both Open Hearth and Bessemer may be specified, we have rolls for all standard rail sections.

Q & C "BONZANO" ROLLED STEEL COMPROMISE JOINTS

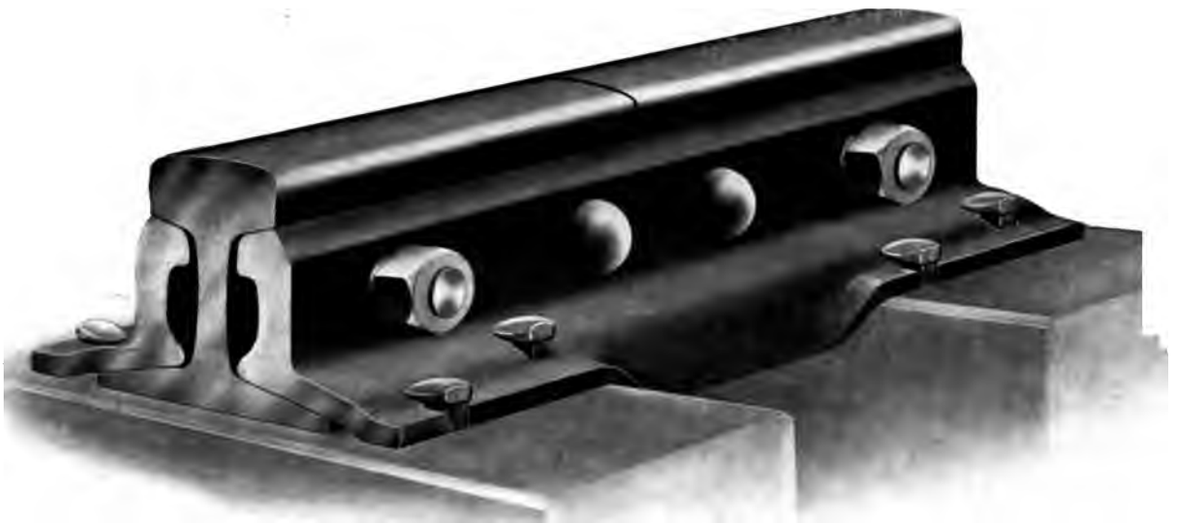
By a patented process we have provided for the fitting of uneven rail sections with Bonzano Rolled Steel Compromise Joints, thus displacing cast steel that was heretofore used for this purpose. The superiority of rolled over cast steel for track construction is obvious.

These joints are manufactured and sold by the Q & C Co. of New York and Chicago under patents controlled by them.

The Q & C Company

NEW YORK OFFICES: 90 WEST STREET
CHICAGO OFFICES: PEOPLES GAS BLDG.

The Railroad, as shown above, has over 3,000 miles of track equipped with "Bonzano" Joints



Q & C "Bonzano" Rail Joint

The Rail Joint Company

General Offices: 185 Madison Avenue, New York City

Makers of Base-Supported Rail Joints for Standard and Special Rail Sections; also Girder, Step or Compromise, Frog and Switch, and Insulated Rail Joints; protected by Patents.

Highest Awards:
Paris, 1900; Buffalo, 1901;
St. Louis, 1904.

CONTINUOUS RAIL JOINT

CATALOG AT AGENCIES

Boston, Mass. - - - - India Bldg.
Chicago, Ill. - Railway Exchange Bldg.
Denver, Colo. - - - Equitable Bldg.
Portland, Ore. - - - - Wilcox Bldg.
Pittsburgh, Pa. - - - Oliver Bldg.
St. Louis, Mo., Commonw'th Trust Bldg.
Troy, N. Y. - - - - Burden Avenue

Montreal, Can. - Board of Trade Bldg.

London, E. C., Eng. - 36 New Broad St.

WEBER RAIL JOINT

WOLHAUPTER RAIL JOINT

CONTINUOUS INSULATED JOINT

WEBER INSULATED JOINT

These Base-Supporting Rail Joints

Sustain the rail ends and at the same time provide for continuous wave motion of the rail.

Eliminate the "hammer blow" and maintain perfect surface and alignment.

Restore low joints to normal surface, and increase the life of the rail.

THE RAIL JOINT COMPANY'S product is not in an experimental stage; it is an acknowledged standard. Not only the best for the price but the best for the purpose.

The Frictionless Rail

Interesting to All Railroad Men

Twelve Stops

Stops excessive thrust and lateral pressure on high rail.

Stops cutting on wearing edge of high rail.

Stops climbing on high rail.

Stops elbowing of joints on high rail.

Stops excessive vertical wear on low rail.

Stops flowing of metal on head of low rail.

Stops outward rolling of both rails.

Stops rapid cutting-in of ties.

Stops excessive wear of wheel flanges.

Stops squealing and grinding.

Stops lateral motion of engine and coaches.

Stops the necessity of applying brakes to steady train around curves.

Above proven by actual demonstrations

F. A. BARBEY, Trustee S. W. SIMONDS, Treasurer

---

683 Atlantic Avenue
Boston, Mass.

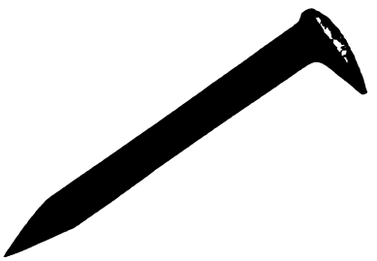
Inland Steel Company

CHICAGO

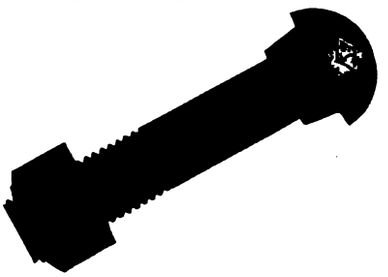
OPEN HEARTH STEEL should be specified by railroads, wherever steel is used, to insure a tough and long-lived material.

This grade of Steel as compared with Bessemer is almost free from harmful impurities, such as phosphorus and sulphur, and, therefore, is not brittle and will resist corrosion longer.

The Bessemer process makes the elimination of phosphorus possible only to a limited degree, whereas the phosphorus and other elements in Open Hearth Steel can be and are carefully and properly controlled in the manufacture of steel, as by the use of limestone the impurities are eliminated, with the result that Open Hearth Steel can be adapted to almost any use for which it may be required, permitting an increase in carbon, which is a very important factor in the production of *Track Spikes*, inasmuch as it materially increases the strength and toughness of the steel with absolute freedom from brittleness, thus overcoming the troubles with both soft and brittle spikes and producing a spike that will drive straighter and not bend. We are prepared to furnish *Track Spikes* in all standard sizes and, if necessary, according to railroad companies' individual blue prints.



Open Hearth Steel makes smoother, stronger, tougher, more homogeneous and more rust-resisting *Track Bolts* than Bessemer and will stand vibration and shock, which Bessemer will not alwaysdo.



We manufacture *Track Bolts* with both rolled and cut threads and with rolled ratchet grip threads.

Nuts may be square, hexagon or recessed.

What we have said above applies equally to Tie Plates, which we are now prepared to furnish. A type in general use is herewith illustrated. Other similar sections can be made and we solicit particulars of the requirements of any railroad with a view to taking care of its orders.

To the critical minded Mechanical Engineer who is particular about the safety and permanence of the materials employed, we recommend our *Rust* and *Corrosion Resisting Iron Sheets "Vismera."* "Vismera" is made with great care from the best of materials. "Vismera" is made from strong Northern Minnesota Ore from our own mines—mixed with our own mill crop ends. It analyzes very low in Carbon, Phosphorus, Manganese, Sulphur, Hydrogen and Oxygen—is entirely free from Silicon and Aluminum Oxides. It possesses very high tensile strength (57,000 lbs.) It can be used for making Culverts, Corrugated Roofing, Roof Gutters and Pipe, Ventilators, Jacks, Stacks, and Refrigerator Work and for other particular purposes where long life is essential.

STRENGTH VISMERA PURITY

INLAND STEEL CO. CHICAGO

Specify Open Hearth Steel Track Spikes, Track Bolts and Tie Plates and "Vismera" for sheets.

Our principal works are located at Indiana Harbor, Indiana, with general offices in the First National Bank building, Chicago. Branch offices at St. Louis and St. Paul.

The Pennsylvania Steel Company
Maryland Steel Company

THE FROG AND SWITCH DEPARTMENT of The Pennsylvania Steel Company is the largest shop in this country devoted exclusively to the manufacture of steam and street railway track work. Practically every part that goes into the manufacture of P. S. Co. frogs and switches is made by this Company. Care and selection of materials all along the line assures the best grades being used in finished work. As one of the few and one of the largest manufacturers of manganese steel, a superior process for the making of this steel has been developed which justifies the trade name, "Manard"—"the Manganese Steel made by the Superior Processes of The Pennsylvania Steel Company." All hard center frogs are made with a Manard insert. Over 17,500 frogs of the famous "P. S. Co. Design 160" have been sold to the largest railroads in the country for main line and yard use. Among the many products of the frog and switch department widely known by railroad men may well be mentioned "Manard Frog, Design 160," "Movable Point Double Slip Crossings with Manard Tipped Points," "New Century Switch Stands," "Rapid Renewable Hard Center Frog for Street Railways," "Pinless Switches for Street Railway Use," "Detector Switch Stands."

Terminal layouts in entirety are designed and manufactured. The entire track work in the new Pennsylvania Terminal, New York City, as well as much of the work in the new Grand Central Terminal, is the product of the Frog and Switch Department.

"MAYARI STEEL" is a natural alloy chrome-nickel steel manufactured from Cuban ores which contain nickel and chromium to such an amount that no further additions of metallic nickel or ferrochrome need be made in the bath to insure their presence in the steel. The worth of alloy steels is now realized. The Pennsylvania Steel Company and Maryland Steel Company manufacture Mayari Rails, Mayari Billets, Mayari Bars, Mayari Pig Iron, Mayari Forgings and Mayari Track Bolts. Heat-treated Mayari Steel Track Bolts have a guaranteed elastic limit of 75,000 pounds per square inch with an elongation of 15 per cent.

Nine Acres of Floor Space Devoted Exclusively to the Manufacture of Frogs and Switches

GENERAL OFFICES of the Companies are located in the Morris Building, Philadelphia, while the works are at Steelton, Pennsylvania, Lebanon, Pennsylvania, and Sparrows Point, Maryland.

The Pennsylvania Steel Company
Maryland Steel Company

RAILS, as manufactured by The Pennsylvania Steel Company and the Maryland Steel Company are very widely known for the high standard of quality maintained. The Pennsylvania Steel Company manufactures all rails, tees, high tees, girder and girder guard, by the open hearth process. Ingots are first bloomed and then reheated before the final passes are made with the attendant advantages in micro-structure which accompany a double heating. The Maryland Steel Company is equipped to furnish both open hearth and Bessemer rails. "Mayari" rail steel is made from very low phosphorous Cuban ores which carry, in the natural state, percentages of nickel and chromium. As a result of this nickel and chromium content, rails rolled from this steel show greater ductility and resistance to abrasion than ordinary carbon steel rails. Careful records show all rails to be remarkably free from breakages.

THE MARINE DEPARTMENT of the Maryland Steel Company is a large and up-to-date ship yard, equipped for building ocean-going steamships of large or small size. The American Hawaiian Steamship Company was so well satisfied with the ships now in their Pacific service built by the Marine Department several years ago, that additional contracts for eight boats have recently been placed with this Company. These ships, of approximately 10,000 tons burden, some completed and others in the course of construction, are designed for Panama service and, it is hoped, will constitute the nucleus of a fleet of American built, American owned and American operated steamships for our reviving merchant marine.

Saybrook Bridge—Saybrook & Lyme Connecticut River Bridge Commission

THE BRIDGE AND CONSTRUCTION DEPARTMENT of The Pennsylvania Steel Company is one of the largest bridge shops in the country. The equipment is adapted to the very heaviest types of steel construction, the largest and heaviest girders being handled with ease. A competent staff of shop and field engineers assures the highest technical expertness. Among the many large contracts executed by this Department may be mentioned, the Broadway Bridge, City of Portland, Oregon; the Queensboro Bridge and the Williamsburg Bridge, New York City; the McKinley Bridge, St. Louis; the steel work for the Municipal Building, New York City.

Carnegie Steel Company

TO meet the increasing demand of a better track construction, made necessary by the severe traffic conditions, brought about by heavy equipment and high speed, interested parties have been developing new devices which will enable tracks to be maintained to the highest efficiency consistent with true economy.

Double Track Installation Steel Cross Ties, Duquesne Rail Joints

STEEL CROSS TIES

The Cross Tie question has received careful and considerable study for a number of years. During this time many preservative treatments of the wood tie have been perfected, which undoubtedly will increase its life by retarding decay; however, the actual life of the tie depends upon its ability to withstand crushing loads and resist mechanical wear. Experience has proven this. During the same time there have been developed many substitutes in the shape of reinforced concrete and metallic ties. The CARNEGIE STEEL COMPANY has been making a study of the Steel Cross Tie situation, and has developed the I-Beam type to a point where it is apparently the only promising substitute in the field today. There are now in use over TWO AND ONE-HALF MILLION of these ties, which represent more than ONE THOUSAND MILES of track, of which approximately 850 miles are on steam railroads and over 200 miles on electric railways. Several thousand have been in service for eight years on the Bessemer & Lake Erie Railroad under One Hundred Million tons of revenue traffic. These ties are in satisfactory condition today, and there is no doubt but what a minimum life of twenty years will be obtained. They can be furnished cut to any length, which makes them especially adaptable for switches. Hundreds of sets have been installed. The ratio of cost is very little greater than the best quality of wood. Many of the important street railway systems have adopted the CARNEGIE STEEL CROSS TIE as standard for permanent construction in city streets.

Installation Steel Switch Ties

DUQUESNE RAIL JOINTS

It is of great importance that track be properly maintained at joints, as upon this

Carnegie Steel Company

depends the life of the rail—in fact the general condition of the track structure. It is imperative that great care be exercised in selecting a rail joint which fully measures up to the various requirements.

The DUQUESNE RAIL JOINT as manufactured today offers a solution of this problem. It is made of carefully selected high-grade steel. All the mechanical work is done upon it while hot, under the most careful supervision. The fact that it is used in large quantities by many of the leading trunk lines, proves its popularity and efficiency.

STEEL SHEET PILING

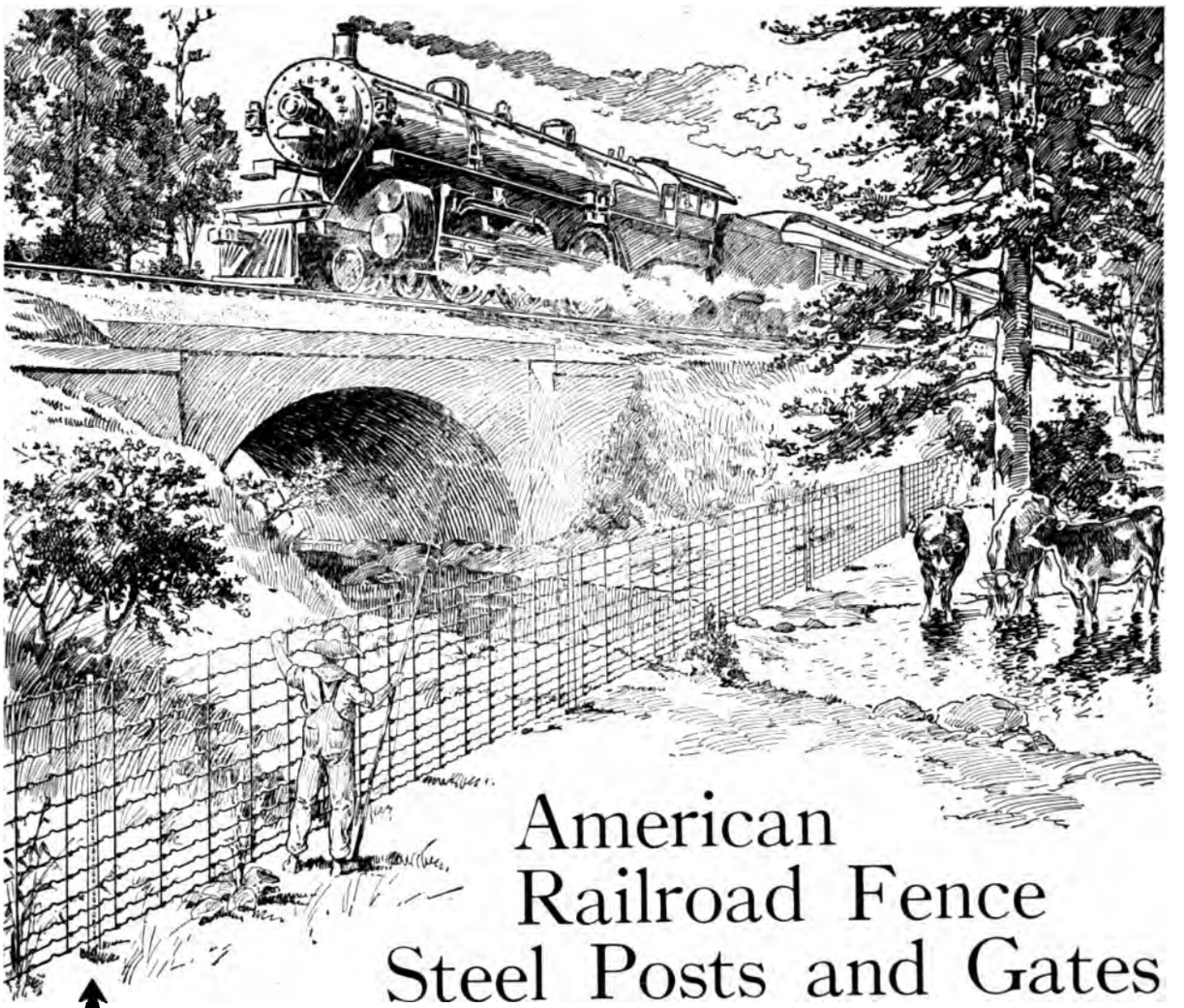
In the construction of cofferdams, retaining walls, foundation pits, sewers and trenches, locks and navigation dams, curtain and core walls, foundations for cylinder piers, and all construction work where, until within the last few years, wood sheeting has been used exclusively, STEEL SHEET PILING has come to be recognized by engineers as a safe, certain, efficient and reliable tool of construction. It not only fulfills the duties of wood sheeting, but is adapted to many lines of use impracticable of execution with that material.

Duquesne Rail Joint

Steel Sheet Piling

STEEL SHEET PILING is manufactured and sold by the CARNEGIE STEEL COMPANY in three forms: United States Steel Sheet Piling,—Friestedt Interlocking Channel Bar Piling, and Symmetrical Interlock Channel Bar Piling. The first is a plain, rolled section, ready for use as it comes from the mill. In its profile it incorporates the advantages of the ball and socket joint, permitting digression from the straight line, yet having sufficiently tight interlocks to be practically watertight without packing. The other types are fabricated designs built up of zee bars and channels.

Pamphlets containing complete description of these specialties may be obtained from any of our district offices or the General Office, Pittsburgh, Pa.

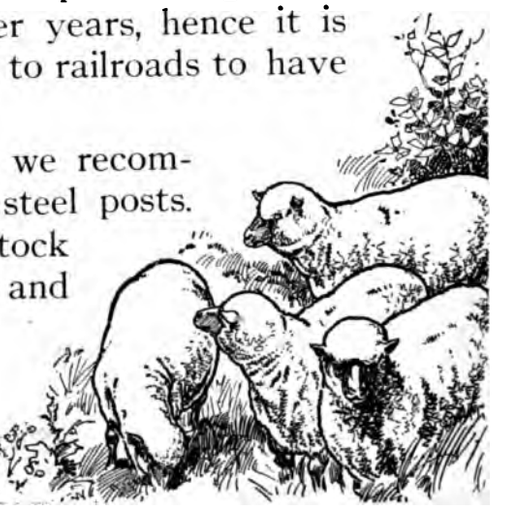


American Railroad Fence Steel Posts and Gates

American Steel Fence Post Cheaper than Wood and More Durable. Get Catalog.

Horses, mules, cattle, sheep and hogs cost twice as much as in former years, hence it is more than ever important to railroads to have their right-of-ways properly fenced.

For absolute right-of-way protection we recommend our American Railroad fence and steel posts. The money saved by prevention of stock claims will quickly pay for all materials and labor required.



AMERICAN STEEL & WIRE COMPANY

Chicago New York Cleveland Pittsburgh Denver
U. S. Steel Products Co., San Francisco

American Steel & Wire Company

Triangle Mesh Concrete Reinforcement

New Chicago & North-Western Depot, Chicago.
320,000 square feet of Triangle Mesh Concrete Reinforcement used.

Is made from cold drawn steel wire. Tensile strength 85,000 pounds per square inch.

A steel fabric of great strength, reinforcing in every direction.

Furnished in rolls of 150, 200 and 300 feet long.

We are now furnishing large quantities of this material for reinforcing concrete highways.

"Engineer's Handbook of Concrete Reinforcement" furnished free upon request.

American Rail Bonds

We manufacture four different styles of Rail Bonds.

CROWN RAIL BONDS—having single stud terminals either solid for compression or tubular for pin expansion, the conductors between the terminals being either solid wires, or strands composed of a number of small round wires.

UNITED STATES RAIL BONDS—having single stud terminals either solid for compression, or tubular for pin expansion, the conductor being composed of flat strips or ribbons.

TWIN TERMINAL RAIL BONDS—having two or more studs on each terminal, the conductors between the terminals being strands composed either of a number of small round wires, or of flat ribbons.

SOLDERED RAIL BONDS—having flat terminals, the connection with the rails being made with solder, the conductors between the terminals being strands composed either of a number of small round wires, or strands composed of flat ribbons.

We also manufacture a very complete outfit of high-grade Tools for installing bonds; and have ample facilities for making Rail Bonds or Tools, of special design for special conditions.

We solicit inquiries for prices and for information on any rail-bonding problems, asking particularly that the conditions may be fully described to us.

Rail Bond Catalogue furnished upon application.

30% SIGNAL WIRE

We are manufacturing an extremely high quality of Signal Wire, meeting the exacting requirements of the Railway Signal Association. Thirty per cent Para rubber, cylindrical, true to gauge and thickness of wall, and subject to critical examination at every stage of manufacture.

Samples on application.

AMERICORE
RUBBER COVERED WIRE

FOR INTERIOR WIRING

A New Standard—A New Wire

Every Coil Certified by the National Board of Fire Underwriters

All Sizes and Voltages

The quality of Americore Wire is such as to make it an absolute standard for interior wiring and to give the best possible fire protection.

Every foot is carefully inspected by us in the various stages of manufacture, and, when completed, is finally inspected by an authorized representative of the National Board of Fire Underwriters.

We are prepared to furnish this wire in all sizes of conductors, both solid and flexible, from warehouses conveniently located for quick delivery to all parts of the country.

Lamp Cord in all varieties. *Ignition Wire for Automobiles and Motor Boats.*

SALES OFFICES

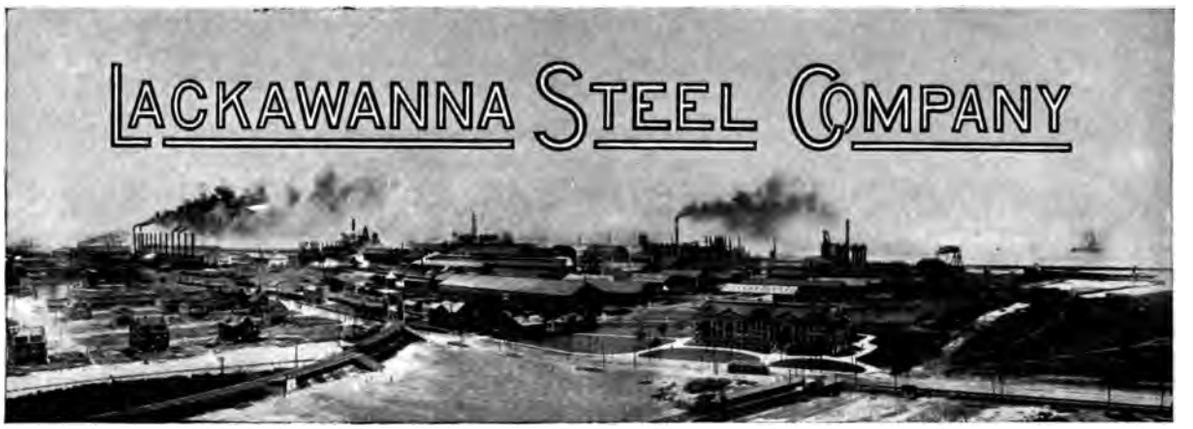
CHICAGO - 72 West Adams Street
NEW YORK - - - 30 Church Street
WORCESTER - - - 94 Grove Street
BOSTON - - - 120 Franklin Street
PITTSBURGH - - - Frick Building
CLEVELAND - - - - - Western Reserve Building
ST. PAUL-MINNEAPOLIS, Pioneer Building, St. Paul
OKLAHOMA CITY, - State National Bank Building
DENVER - - - - - - 1st National Bank Building
SALT LAKE CITY, Walker Bank Building
BUFFALO - - 337 Washington Street
DETROIT - - - Foot of First Street
CINCINNATI - Union Trust Building
ST. LOUIS Third Nat. Bank Building

UNITED STATES STEEL PRODUCTS COMPANY

New York - - - - - - - 30 Church Street

PACIFIC COAST DEPARTMENT

San Francisco - - - - - - - Rialto Building
Portland - - - - - - - - Sixth and Alder Streets
Seattle - - - - 4th Avenue South and Conn. Street
Los Angeles - - - Jackson and Central Avenues

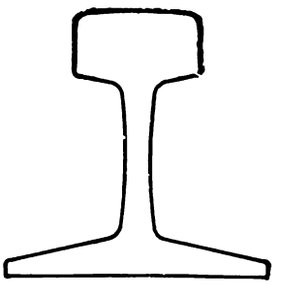


OPEN HEARTH AND BESSEMER
STEEL PRODUCTS

Standard and Light Rails, Contact Rails, Angle and Splice Bars.

Abbott Rail Joint Plates and Tie Plates. Ingots, Billets, Blooms and Slabs. Standard Structural Shapes.

Sheared and Universal Mill Plates. Sheet Bars.



Merchant Bars in Rounds, Squares, Flats, Ovals, Half-Ovals, Hexagons and

LACKAWANNA STEEL SHEET PILING

Arched Web, Straight Web, Center Flange and Protected Types.

THE ABBOTT RAIL JOINT PLATE

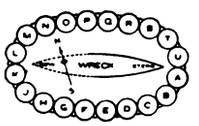
Reinforces the angle bars, protects the rails, preserves the ties, makes smooth track. Improves the road service, saves the rolling stock and reduces labor. Made to fit two-tie angle-bar joints on any weight of rail from 40 lb. to 100 lb. per yard.

LACKAWANNA STEEL COMPANY

General Sales Office and Works: Lackawanna, N. Y.

NEW YORK	BUFFALO	PITTSBURGH	CINCINNATI	DETROIT	ATLANTA
BOSTON	PHILADELPHIA	CLEVELAND	CHICAGO	ST. LOUIS	SAN FRANCISCO

LACKAWANNA STEEL SHEET PILING, WHICH MADE THE RAISING OF THE MAINE PRACTICAL, CAN BE USED WITH GREATEST SUCCESS IN MANY RAILROAD CONSTRUCTIONS



Raising the Battleship Maine from Havana Harbor was an engineering feat without precedent and the successful outcome was largely due to the perfect performance of the Lackawanna Steel Sheet Piling used in the cofferdam.

This cofferdam was based upon 20 equal connected cylinders of piling driven in 75-foot spliced lengths and making an enclosure only large enough to clear loose parts of the wreck. The cofferdam when unwatered had to withstand pressures from a 37-foot head of water in the harbor and from 21 to 23 feet of soft harbor bottom. The inside wall of each cylinder was subjected to the pressure from about 40 feet of soft clay filling, loaded onto the original harbor bottom.

The highest obtainable ultimate joint strength of the steel sheet piling was essential, hence the government required a guarantee of 9,700 pounds per lineal inch of interlock. Tests upon the Lackawanna Steel Sheet Piling under government supervision showed results up to 16,000 pounds and of 48 tests only two fell below 10,000 pounds—the average being 11,975 pounds. No authoritative figures proving such high strength have ever been offered for any other steel sheet piling.

The driving of this piling proved equally satisfactory, the closure in every instance being effected easily with standard sections, and of almost 7,000 tons used, every piling bar drove perfectly except one which had been bent in handling. The completed cofferdam was remarkable for true circular form of cylinders and uniform level of tops of the piling.

After the Maine had been successfully removed, the piling was pulled and most of it was found fit for further use.

Lackawanna Steel Sheet Piling, because of its high joint strength, driving qualities, fitness for re-use has met with much favor in railroad construction work and is used extensively in open caissons, for bridge piers, for retaining walls on embankments, as core walls for levees, as curtain walls for the retention of such treacherous subsoil as quicksand, etc.

In a recent railroad installation where driving was difficult Lackawanna Steel Sheet Piling was found to have cut through a sunken canal boat filled with stone, yet this piling served its purpose well, and was pulled and re-used no less than six times.

The range of service of Lackawanna Steel Sheet Piling is explained in bulletins of the manufacturers —the Lackawanna Steel Co., Buffalo, N. Y. These bulletins will be sent upon application.

Manganese Steel in Track Work

THIS Company is the oldest as well as one of the largest manufacturers of special track work in the country. Its product is well known for its high quality, and included among its specialties are the Wharton Unbroken Main Line Switch, the Wharton Guard Rail Clamp and Wharton Manganese Track Work, this Company being the first to recognize the possibilities of manganese steel in this field.

It is curious to recall at this time, when Manganese Steel Work is so generally used, the antipathy there was twelve years ago to the use of this metal in steam railroad track structures, when this Company, after previously having had six years of good results from it in street railway work, introduced it in steam road work. Track men generally were skeptical regarding the use of a cast metal in structures subject to such heavy pounding as frogs and crossings, but if any one should desire proof today regarding the advisability of using frogs made of manganese steel, we would respectfully refer him to data recently given out by some of the largest and most important systems in the country. These show in some cases manganese steel center frogs outlasting regular bolted frogs ten to one, and where records were kept of the maintenance charges, it was found that the manganese steel frogs cost but half as much to keep in shape as the bolted frogs. When it is considered that the average price of manganese frogs today is but two to three times that for the ordinary frog, it will be seen that there is no question but that the manganese steel frog is much more economical in the end.

It must be borne in mind however, that all kinds of manganese steel will not give such good results. The fact that the metal contains a certain percentage of manganese is no guarantee that it will give good service. Of course, the metal must be chemically correct, which is, comparatively speaking, a small matter, but the wearing qualities are derived absolutely and solely from a special treatment, imparting to it a proper relation of hardness and toughness which experience has shown to be the best for each of the various purposes for which it is used. This is the Taylor-Hadfield patented treatment, and is used in track work in this country only by this Company. No other has equalled the results obtained by this Company's material, and any railroad can prove this for itself by looking up its own records if it has used different makes of manganese steel.

There is only one conclusion to be reached, therefore—*the most economical track work today is Wharton Manganese Steel Work*, samples of which are on exhibition in spaces 247, 248, 249 and 250, First Regiment Armory.

Wm. Wharton, Jr. & Co., *Incorporated*

Philadelphia, Pa. :: Jenkintown, Pa.

Economy Tie Plates

IN the following pages are illustrated but a few of the many and varied types of Economy Tie Plates as manufactured by this company. A full and complete line will be on exhibition in March, and railway men visiting the Coliseum will find them shown as usual in exhibit spaces 122, 141, 142 and 143.

With an experience of fifteen years, the Spencer Otis Company is in a position to be of assistance to railway officials in aiding them in determining just what style and design of tie plate is most suitable to meet the particular conditions of the individual road.

This company is more than a manufacturing and selling concern. It has specialized in this particular line of railway equipment and occupies the position of the expert engineer in a special field. A tie plate for use with screw spikes was originated by this company, and the value of screw spikes was early appreciated by them. Realizing that the duties of the railway officer are very complex and that he has many and various problems constantly confronting him, this company is always glad of the opportunity of rendering any service it can to the railroads, their officers or employes, by giving them the benefit of their experience in the manufacture and installation of tie plates.

The purpose of the tie plate is to protect the tie. The tie plate, however, means something more than a piece of rolled steel placed between the base of the rail and the tie. Like many other apparently simple things, the importance of the design and construction is ofttimes overlooked.

A tie plate that offers the greatest advantages must provide a positive shoulder to hold the rail to gauge. It must offer a maximum bearing to the rail, and it must distribute the load of the rail evenly over as great an area as possible. It must take sufficient grip on the tie to prevent movement and wear between the tie plate and the tie, and at the same time must not so injure the fiber of the tie that decay is invited. It must facilitate the correct driving of spikes and assist in preventing lateral thrust on the head of the spike, and so prevent any opening behind the head of the spike, for here it is that decomposition is most likely to set in. It must also be made of a material of maximum strength.

In addition, for use with screw spikes, a tie plate must be so constructed as to assure a vertical position of the spike when seated. It must supply a guide for the proper boring of the hole for the spike, and it must give the head or flange of the spike perfect bearing on the rail and on the tie plate, which must be all of one piece.

There are a great many other important features to the tie plate as applied to rails in general, and of course the many different rail sections call for many different sizes of tie plates, if satisfactory service is to be rendered by them. The manufacturer of them, like the manufacturer of any other railway equipment, is in position to know probably better than any one else just exactly what the results are from that certain equipment. This is the way with the tie plate. The Spencer Otis Company has the benefit of their own experience, which means the experience of many railroad officials of many different roads where tie plates have been installed. The question of securing the right kind of railway appliances and equipment is a problem which should be taken up jointly by the railway officer and manufacturer of railway supplies. In this way, benefiting by the experience of each, the best results can be accomplished, which will make for the economical operation of the railroads. The Spencer Otis Company takes just this view of the matter, and is glad at all times to place before railroad officials its experience of years regarding tie plates, their design, construction and installation.

ECONOMY TIE PLATES

A SPECIAL plate of Rolled Steel to work with screw spikes. At either end are elevated bosses with the same angle as the base of the rail. The spike-holes act as jigs when applying spikes, and the angles of the bosses absolutely prevent the spike from assuming any but a vertical position when seated. The bosses also afford reinforcement back of the head and a bearing for the flange of the screw spike not in contact with the rail base.

We can furnish this plate perfectly flat on the bottom, or with four longitudinal flanges as shown.

Rolled 8 inches, 8½ inches and 9 inches long, 6 inch, 7½ inch and 8 inch widths for 80 to 100 pounds A S C E, also for 90 and 100 pounds A R A, A or B section of rail; ⅜ inch, 7/16 inch and ½ inch thick.

MANUFACTURED AND SOLD BY

SPENCER OTIS COMPANY

CHICAGO ST. LOUIS

NEW YORK

ECONOMY TIE PLATES

Economy No. 9-R-F

ELEVATED BOSS SHOULDER PLATE FOR SCREW SPIKES

A special plate of Rolled Steel to work with screw spikes. At either end are elevated bosses with the same angle as the base of the rail. The spike-holes act as jigs when applying spikes, and the angles of the bosses absolutely prevent the spike from assuming any but a vertical position when seated. The bosses also afford reinforcement back of the head and a bearing for the flange of the screw spike not in contact with the rail base.

We can furnish this plate perfectly **flat** on the bottom, or with **four longitudinal flanges** as shown.

Rolled 8 inches, 8½ inches and 9 inches long, 6 inch and 7½ inch widths for 80 to 100 pounds A S C E, also for 90 and 100 pounds A R A, A or B section of rail; ⅜ inch, $\frac{7}{16}$ inch and ½ inch thick.

Special plates for Guard Rails 13 inches and 15 inches long, 6 inches wide.

MANUFACTURED AND SOLD BY

SPENCER OTIS COMPANY

CHICAGO ST. LOUIS

NEW YORK

ECONOMY TIE PLATES

Economy No. 15

Economy No. 15-A

These designs of Rolled Steel Tie Plates seem to meet with favor where an extra high shoulder is required. We are prepared to furnish these plates either for two, three, or four hole punching. Made with solid top if desired and designated Economy No. 14.

Above cuts show shoulder arrangement for three or four hole punching.

Rolled 8 inches, 8½ inches and 9 inches nominal lengths; 5 inch and 6 inch widths; ⅜ inch and ½ inch thick.

MANUFACTURED AND SOLD BY

SPENCER OTIS COMPANY

CHICAGO ST. LOUIS

NEW YORK

ECONOMY TIE PLATES

Economy No. 1

Economy No. 2

THE ECONOMY ROLLED STEEL FOUR-FLANGE TIE PLATE

THE ECONOMY TIE PLATES Nos. 1 and 2 unquestionably combine strength, rigidity and economy, and meet without question the following requirements:

Ease of application to hardwood ties.
Easy readjustment for track alignment.
Increased adhesion to tie.
Maximum strength to prevent buckling.
Reduction in number of spikes used.
Protection from spike wear from traveling rail.
Maintenance of position when once applied.
A single plate suitable for all track requirements.

These plates are rolled 7¼ inches, 8 inches, 8½ inches and 9 inches nominal lengths; 5 inches width; and ⅜ inch and ½ inch thick. Also 7¼ inches, 8 inches, 8½ inches and 9 inches nominal lengths by 6 inches width; ⅜ inch, $\frac{7}{16}$ inch and ½ inch thick.

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CHICAGO ST. LOUIS

NEW YORK

ECONOMY TIE PLATES

Economy No. 8

THE ECONOMY RIBBED TOP REINFORCED SHOULDER FLANGED PLATE

This plate is entirely new, and of the same design as our No. 6 Plate, except we have added two depending flanges—designed to give the plate adhesion to the tie and assist in the holding power of the spikes.

Rolled 8½ inches and 9 inches long; 5 inches, 6 inches, 7 inches, 8 inches and 8½ inches wide; ⅜ inch, $\frac{7}{16}$ inch and ½ inch thick.

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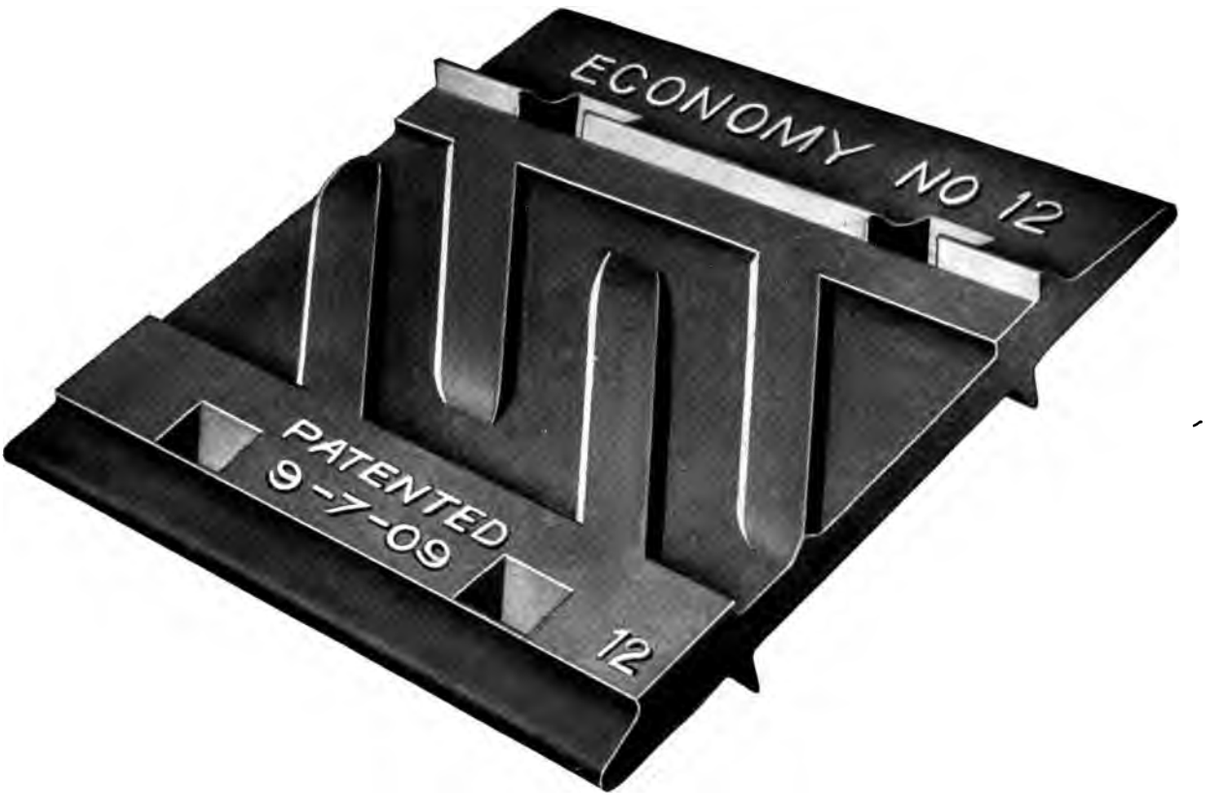
SPENCER OTIS COMPANY

CHICAGO ST. LOUIS

NEW YORK

ECONOMY TIE PLATES



Economy No. 12

THE ECONOMY ROLLED STEEL TRANSVERSE FLANGE TIE PLATE

A strong plate materially reduced in weight. **Note** the area of rail bearing surface as compared with other plates of like character. The transverse flanges furnish adhesion to the tie and will prevent spreading of the rails. Furnished without flanges if desired.

Rolled 9 inches long and to widths 5 inches to 8 inches; $\frac{7}{16}$ inch, ½ inch or thicker if wanted.

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SPENCER OTIS COMPANY

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